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EDITORIAL NOTES—GAS, &c.

The British Gas Industries.

GOOD work and steady progress in membership sum up, with brevity, the record of the Society of British Gas Industries, whose annual meeting was held on Thursday. The members are evincing on all sides an active loyalty to the industry in which their interests are concentrated. The risings and the fallings of the gas-supply curve are to them the indications of their own trading prospects; and from the side of those concerned in gas supply, the progress of the results of the inventive genius found in the ranks of the members of the Society is interestedly watched with an eye to manufacturing economies and to the broadening of the base of utilization of product. "We cannot do without you," remarked the President of the Institution of Gas Engineers (Mr. Thomas Glover) at the annual dinner of the Society; and the venerable President of the Society (Mr. Thomas Newbigging), in that philosophic and didactic address of his to the members, admirably said: "My imagination enables "me to see that, if judiciously administered, the Society is "destined to have a famous future history." The pace has been slow. The novelty of the manufacturers and contractors being organized for industrial advantage in the whole and not trade benefit in any particular, suggested to not a few that time was needed to ascertain how the organization would comport itself. The members have before been told that their objects and aspirations are good; the same is said to-day emphatically and without any hesitation. The work delineated in their report shows their interest in the common progressive prosperity of which they take part; and the evidence will be almost immediately forthcoming, in their participation in the necessary provision for scientific research, of their desire to aid progress in the future. Sympathy and support for this purpose (then already assured) were asked by Professor Smithells at the dinner.

On such an occasion as this meeting, and with such an address as that which Mr. Newbigging has inserted in the records—an address that fills us with the importance of our special industrial concerns, inspires with an ambition to attain to greater heights, and imparts confidence—the vast stretches of the industry and its infinity of detail are impressed upon one in a manner that is impossible in the case of the man who tries to confine himself to official routine, refuses to rub shoulders with the men of the world beyond, and restricts his interests to the duties demanded by reposed trust and conferred money recompense. Down the long road of a life of imposing usefulness—usefulness of an order that less brilliant gifts do not permit the majority of men to look back upon—Mr. Newbigging glances; and his observation assures him that the industry has never stood in a stronger and healthier position than now, nor have prospects ever been so good. But in the future all hands will be wanted; and there must be no slackening on the part of anyone while on the active list. There is plenty to be done, even to fighting against municipal monopoly and Socialism, warning in regard to which was eloquently uttered by Mr. Balfour Browne during the after-dinner proceedings on Thursday. While strongly opposed to municipal ownership on grounds that need not be re-stated here, we must say that there are municipal gas undertakings which can be set apart as being unidentified with the pernicious characteristics of the modern developments of municipal trading, and which —were it not for the stigma attaching to municipal control of abstracting large sums of money from the pockets of gas consumers for the relief of the rates—in both their operation and results greatly narrow down (apart from the question of principle) the objection felt to municipal administration. There are, however, dangers assailing even such undertakings; and those dangers arise from the new elements in the constitution of the controlling bodies. Mr. Balfour Browne asserts that municipalities are seldom pioneers; but he forgets for the moment the disastrous consequences of much of their pioneer work in speculating in electricity. The learned Counsel, however, urges the custodians of the gas industry to watch and ward its interests very carefully; for, if they do not, the advances of Socialism will tend to wreck it with the other industrial enterprise that is the strength of our country.

There were one or two controversial matters, of a partly political and partly industrial nature, touched upon in the course of the meeting by the President—the questions of the Coal Mines (Eight Hours) Bill and the tax upon exported coal. We will by-pass them on this occasion, inasmuch as there is a galaxy of matters and brilliant intellectual points sufficient in the address for private reflection without disturbing thought for the moment over conditions that, for good or ill, have been imposed on the country, or without spending time in any unprofitable metaphysical investigation into that which lies behind the free traders' advocacy of the limitation of the hours of labour, which is the commodity conferred upon man by a higher power than himself with which to trade.

One other matter deserves mention; and that is the completion of the discussion between the Council of the Institution of Gas Engineers and the Council of the Society of a model set of standard clauses for contracts. What was thought impossible but a year or two ago has been found to be possible. The clauses adopted were devised by Mr. C. E. Brackenbury; and in their discussion at the conferences with the Council of the Institution, the Society have been led by their friend and first President (Mr. Dugald Clerk). Public approval to the model clauses has been given by Mr. Newbigging as President of the Society, and by Mr. Thomas Glover as President of the Institution. It was work that, in the interests of fair dealing and of reasonable terms as between contracting parties, required doing; and the joint production of the model clauses will do much to ensure their wide adoption. We do not think the appeal to the majority of gas engineers to adopt them in future contracts will be made in vain.

Manchester Institution Meeting.

OF one thing the members of the Manchester Institution cannot complain regarding their meeting on Saturday, and that is that the interest compressed into the day's programme was not varied, and suffered from being commonplace. Any one of the primary items would have been an abundant reason for visiting Manchester. It has been given to but few engineers, and Mr. J. G. Newbigging is one of them, to have to construct a gasholder of such mammoth dimensions as one approaching a capacity of 10½ million cubic feet; and the inspection of the large engineering work at the Bradford Road station of the Corporation Gas Department was in itself an exceptional educational treat. So also was the examination, at the works of Messrs. R. & J. Dempster, of the new Feld centrifugal washer, a full account of which novel machine appeared in our pages on July 28 last. The Inaugural Address, too, of the successor to Mr. Tim Duxbury in the presidency—Mr. J. W. Morrison—was overflowing with the vitality that must animate all associated with such a concern as the Sheffield Gas Company. And, finally, there was the paper, by Mr. Robert Watson, on the make and sale of coke—a subject that becomes increasingly important with enlarged output, the exigent overtures for custom of fresh competitors, and the violent fluctuations of markets, consequent upon vacillating coal values and trade conditions.

Limned through Mr. Morrison's address are practical thought and progressive action; and no one should miss perusing and studying its every detail. But before passing to the main themes, the President took the opportunity of drawing attention to the claims of the Livesey Memorial

Fund. With him, we regret exceedingly that, to the present time, so few of the gas-owning local authorities of the country have contributed; and yet the North of England municipal undertakings, of which there are more within a given area than in any similar sized portion of the country, are mostly within easy reach of Leeds University. We know the common and ready excuse about powers, and this and that being *ultra vires*. There are, however, to be found in the list of contributors municipal bodies of no mean degree who give, in this instance, proof of the soundness of the adage, "Where there's a will, there's a way."

If there is one section of the address that has paramount interest, it is that which deals with the commercial methods of the Sheffield Gas Company, and by which methods they cultivate their gas business and maintain it so very largely free from intruders. The Corporation Electricity Department are always bemoaning their fate that they are brought into competition with the cheapest priced gas, under Company administration, in the country; and the suction-plant people have, in the square miles of the Company's area of supply, only one plant to their credit! The men of Sheffield cannot afford to be worried with suction gas when, at their very doors, there is a high thermal value coal gas on tap (with all the worries, and labour, capital, and maintenance charges left behind at the gas-works) at for power 1s. per 1000 feet. Suction-gas plants are not wanted; there is no room for them there. This confirms what was said in these columns but a few weeks ago, that the objective of the industry must be a cheap gas, fairly rich in B.Th.U.'s; and under such conditions the gas field for lighting, heating, cooking, and motive power is as safe as real estate. The Sheffield Gas Company have been extremely modest in the past. Their accounts have shown—the price of gas (1s. to 1s. 4d.) has proved—the existence of a concern that has been under superlative administration over a long course of years; but there has been little said as to their internal working and commercial actions. There has been nothing to hide; and there has been no intentional hiding. But the opportunity has not presented itself for lifting the curtain that screened the interesting detail. It has come in this presidential address; and there is provided a peculiarly interesting sketch of the affairs of the Company.

Conditions enabling gas to be sold at so low a price as in Sheffield, are not built up in a day. Anywhere a present low capital account per unit of output is evidence of original circumspect administration, and of its continuance through succeeding years; and the price of gas invariably follows the whittling down of the demand per 1000 cubic feet in respect of capital charges. Though time will admit of impression being made on capital per million by writings off for depreciation, it must be said that the feverish anxiety of some Boards to do this, according to certain accounts that come under notice, is unreasonable to the present generation of consumers, and an undoubted advantage to posterity. There should be a judicious treatment of finance in this regard; and that judicious treatment the Sheffield Directors have, to the advantage of the consumers and the undertaking, applied over a long span of years. The Board have not allowed the existence of dead or unproductive capital charges; and every asset has been maintained on the active list. The Sheffield Company are further almost unique, in that, their price being low, and two and three light meters common through the district, there has been no occasion for them to incur the heavy capital outlay necessitated by the cultivation of business on the prepayment meter system, as has been the case in the majority of towns. The establishment of this favourable condition may almost be said to have anteceded the advent of the singularly rapid universal popularity of the prepayment system throughout the country. Meter-rents are charged; and all fittings are on hire or else hire-purchase—not supplied free. Being a hardware city, most of the coke is disposed of locally. From top to bottom, the Company are the masters of the gas business, and all that proceeds from it, in the city. These are advantageous conditions, which, in their special circumstances and environment, cannot be established by many undertakings. But there are imitable features of the management that could be immediately applied by most undertakings. The Company, in the interests of economy, enter into their contracts for new work when trade is bad and prices are low. There is good argument to be adduced in favour of their practice of making (instead of a larger quarterly charge exclusive of mantles and glasses) a small inclusive monthly charge per point—equal to cost price taking the whole year through—for the maintenance of incandescent burners and mantles; and, big trafficking concern that it is, the care of a single burner is not too small a matter for it to undertake. That is the essential spirit for these times. There are canvassers for new fittings and lamps; and advice and estimates are freely given for improved lighting. Gas-fires are cleaned free; and an engine fitter makes a periodical inspection of customers' gas-engines. There is a completeness and broad liberality about these methods that serve to heighten admiration for the Company, inasmuch as they show that those responsible for the administration are not content to rely solely upon the lowness of price for the protection of their large interests.

It is impossible to traverse the vastness of subject-matter compressed into the address. On most subjects, there is very general agreement with the President. The part of the deliverance dealing with electricity has some piquant references to municipal trading. There is nothing whatever to fear in respect of private business where, as in Sheffield, the gas for a 60-candle light for 1000 hours' burning can be obtained for 4s. 8d.; while the electricity for a 50-candle power Osram lamp for the same period, at 4d. per unit, costs 20s. 8d. The favourite slander of gas by electricians has reference to the alleged contamination of the atmosphere by the products of combustion. But what have the electricians to say to these sentences from the President's address: "The Sheffield Corporation Council Chamber is "electrically lit; and members are frequently complaining "of the impurity of the atmosphere therein. This was "tested during a meeting of the Council last month, and "found to contain four or five times more carbonic acid than "is considered the limit for public halls." But as against this, our electrical friends will derive satisfaction from the knowledge that systematic tests of the gas distribution system in Sheffield, and special experiments, show that where there is absolute (as in Sheffield) compliance with the Board of Trade regulations in regard to the construction of tramway systems, and every care is exercised, there is no need for alarm on the question of electrolysis. Care and compliance are the requirements of safety. But local authorities are a power unto themselves; and all are not so careful over Board of Trade regulations or any other regulations as the Sheffield Corporation. They require the force of a protective clause in favour of those upon whom they may inflict injury to keep them up to regulation mark.

Ammonia Recovery from Coal Gas.

In the Inaugural Address of Mr. Morrison, referred to in the preceding article, there is a suggestive observation in regard to the recovery of ammonia from coal gas. It has been obvious, from the early days of gas manufacture, that the simplest method of extracting ammonia from gas is by direct absorption in acid. Two principal and a number of minor difficulties have, however, hindered the use of this apparently simply direct method. One chief difficulty is that of the dilution and contamination of the absorbing acid by the aqueous vapour and certain other constituents of the gas; the other, the deleterious effect of the acid treatment on the illuminating power of the gas. The latter point is now, however, owing to the changed conditions under which gas is burned for illuminating purposes, of much less importance than at one time. Moreover, Mr. Morrison states that Messrs. Koppers claim that the treatment of coke-oven gas by acid for the recovery of ammonia, according to a process which they have protected, does not deteriorate the "quality" of the gas. Doubtless the quality of such gas is judged mainly from the standpoint of its calorific value, but illuminating power is also involved, though to a less extent, therein. Hence it may be inferred that common coal gas would retain a sufficiency of "illuminating power" to meet the modern requirements of a public supply, even after treatment with acid for the extraction of its content of ammonia. The effect on the acid in the saturator has, however, still to be considered.

Mr. Morrison indicated to his audience last Saturday how Messrs. Koppers have apparently succeeded, at the large installation of coke-ovens which he inspected, in avoiding any trouble from the cumulative dilution of the acid in the saturator. They first condense the gases to 60° to 70° Fahr. for the removal of tar and moisture in excess of the proportion which saturates gas at that temperature. This may be regarded as equivalent to the work of the condensers and tar-extractors on a gas-works. But instead

of sending the gas next through washers and scrubbers, Messrs. Koppers heat it to about 150° Fahr. out of contact with water, and pass it, thus heated, into the acid in the saturator. Obviously, the hot gas is not nearly saturated with moisture at its temperature; and it becomes merely a question of the strength of the saturator acid whether the gas will give moisture to, or take it from, the latter. The strength used was not stated by Mr. Morrison; but it seems that the gas abstracts moisture from the acid (instead of *vice versâ*), and so keeps the latter up to normal strength which is adequate for the complete absorption of the ammonia from the gas and its conversion into splendid coarse crystals of sulphate of ammonia. There is clearly an attractiveness about such a direct method of producing sulphate, dispensing as it does with the customary washing and scrubbing plant. But gas-works conditions differ in many respects (some of which Mr. Morrison has indicated) from those of cokeries; and it is more than doubtful if the Koppers procedure could be forthwith adopted on a gas-works with satisfactory results. But whether an adaptation of it to the recovery of ammonia from common coal gas may not be forthcoming, having sufficient advantages to justify its extended trial in the gas industry, is a question which is worthy of serious thought.

The Home Market for Coke.

THE moral of the paper read by Mr. Robert Watson at the Manchester Institution meeting on "The Make and Sale "of Coke," is the wisdom of adopting special means for developing the home consumption of this residual of gas manufacture. The home market for coke is one that, it must be admitted, has been much neglected in the past, and left largely to take care of itself, though as a matter of fact there is a more lucrative business to be done in coke, if properly attended to, within the area of gas supply than there is in trading at a distance with all its attendant loading and unloading and transmission expenses; and coke bought in bulk from a distance rarely realizes the same price as can be commanded locally. But more to this phase of the subject presently.

The paper was really divided into two parts. In the fore part were statistical computations; and in the second part, useful suggestions for the development of home markets. Statistical work no doubt looks imposing; but putting an estimate on the relative value of the two sections of the paper, the second one appears to us to be the superior. Data on which coke calculations can be made are grossly inconclusive and delusive. Mr. Watson acknowledges that comparisons between undertaking and undertaking are most difficult; and we may add that averages are not much good, as the practices of gas-works in regard to measurement and entering up of the material are so varied as to introduce disturbing factors of the most suspicious character. There is in many gas-works too much guesswork about the whole of this part of the business. Take a case where the stock of coke is measured up once in the half year, and only the quantities sold for local requirements weighed, and all used one the works or despatched by rail estimated. What dependence is there to be placed on the resulting figures? Take a works where only the coke used in the retort-furnaces is charged as "works fuel;" all other quantities consumed (and in the aggegate at the works they make a fairly considerable quantity in the year) being charged up and credit taken as coke sold. Such practices—no legitimate complaint can be made against them if preferred—bring down, by a not negligible total, the works fuel, the fuel returns look well, and the amount of coke accounted for as sold is proportionately increased. In most gas-works one can find special practices in regard to this residual that introduce such inharmonious relations as to vitiate averages or comparisons of any kind to the point of being almost valueless. A like remark applies to the figures as to the total amount of coke available for sale from the gas-works of the kingdom, based on the gas undertakings returns; these official documents ignoring the hundreds of non-statutory gas-works that exist in the country. Nor can there safely be mirrored by statistics the progress in assistance of water-gas plants in relieving the coke market, as the use of such plants is subject to circumstances of periodic, general, or local character. The positions of the oil and the coke markets, and the temporary flights of demand and recessions of requirement for coke all have their bearing.

Unless special effort is made, coke cannot alone cut through the prejudice that exists against change of any kind, and the big rough coke that was at one time sent out as good enough for domestic fuel purposes gave to the already existing prejudice a still stronger hold. It is somewhat astonishing to learn that such a large proportion as 22 out of 50 works from which Mr. Watson obtained an account of practices in this regard should still be so far ignoring the home coke trade as not to supply specially broken coke, although if these 22 happen to be users of coke-conveyors, they may submit, as extenuating an apparent neglect, that there is not much to choose, taking the coke through and through, between the size of the material they offer for sale and that which is specially broken for sale in gas-works where barrowing the coke from the retort-house still prevails. However this may be, there is, in the experience of Doncaster, a considerable amount of encouragement to the making of a special attempt at developing local trade in broken coke. There is a wealth of significance in Mr. Watson's statement that "no coke has been sold outside the district since the supply "of broken coke was undertaken three years ago. Prior to "that time some 10 per cent. of the coke was sold to cement "manufacturers." On every hand, in and about London, there are the signs of revived effort to secure a larger home trade; and the system of retailing 28-lb. quantities in paper bags is a proposition the success of which in places has made other managers look upon it as a means to a valuable end. Mr. A. E. Broadberry, however, has pointed out that coke must not be packed wet; otherwise the paper bags suffer such injury as to be useless. There is plenty of waste heat about a gas-works, some of which can be put to service for the purpose of drying the coke. This reminds of the coke-drying plant that the old Paris Gas Company used—probably it is still in use—at their Clichy station; the contracts for coke supplied to the French railway companies specifying that it should be quite destitute of moisture. The plant consisted of a hot-air tunnel-like chamber, about 77 yards long; and the coke was carried through by conveyors. It may be remembered as being very successful by those who visited Clichy during the Paris Exhibition of 1900. The President (Mr. T. W. Morrison) also mentioned, in his address on Saturday, the subject of the cultivation of the home coke trade; and he referred to the practice of the Sheffield Gas Company of giving credit for coke to gas consumers. From experiences in that city, Mr. Morrison regards this as an effective means of improving local sales. Coke is essentially a commodity that in its disposal is the better for a broad market basis; and the nearer the basis is to the source of production, the greater the advantage. The broad market basis gives greater latitude for the control of prices, and greater security against their violent oscillation. These are good grounds for encouraging by every means the small home consumer. Remember what the penny-in-the-slot system has done for gas.

Gaslight and West Ham Amalgamation.

THE unsuccessful opposition, at the West Ham Gas Company's meeting, to the scheme for amalgamation with the Gaslight and Coke Company cannot be regarded as having any special significance or bearing upon the ultimate issue. It is not suggested that those who spoke against the proposal were not actuated, according to their individual lights, by a full conviction as to the correctness of their case; but it must be submitted that those among the proprietors who had any serious, if unfounded, misgivings were just those who would be present at the meeting, to make their voices heard in the expression of their views. It was a remarkable exhibition of confidence in the Board that there should have been so few who felt constrained to take this course, that there should have been such a small proportion of the proprietors (though the attendance was larger than usual) who saw any occasion to be present at the meeting, and that such a large number should have ratified by their proxies the action of the Board in entering into what, after all, was merely a provisional agreement. The attitude of a majority of the small band of malcontents at the meeting seemed to indicate that their interest in the matter was purely local, that they had certain fears lurking in their minds that some unknown injury would be inflicted by the proposed amalgamation upon the district in which their private interests are centred, and that they could not rise to any appreciation of the economic possibilities of the scheme. When speakers whose interests are more remote, and who gave no tangible reason for a maintenance of the *status quo*, put forward points that

were generally more irrelevant than relevant to the situation, the few local opposing proprietors expressed approval—glad enough to obtain anything, whatever its intrinsic quality, with which to supplement the little stock of argument in their possession.

We cannot compliment the speaker who led off the opposition. There was insinuation of personal motive, which was unworthy, but which is wrecked directly that which is being permanently relinquished is compared with that which will represent compensation. Then, again, the position, the opportunities, and the prospects of the Gaslight and Coke Company cannot be viewed from the standpoint of what they have been, but must be regarded from the standpoint of what they are. It is because of change, and the proof that has been given of the possibilities that exist in the concern, that make the present scheme from the West Ham point of view one that deserves respectful consideration, and not hasty dismissal. But perhaps the most surprising, and in our opinion injudicious, part of the opening hostile speech —coming from a gas company shareholder—was what was tantamount to direct encouragement to the West Ham Corporation to cherish the idea of municipalization of the gas supply. Having in mind the financial results of the municipal administration of the West Ham Electricity Department, we say better by far for the ratepayers amalgamation with the Gaslight and Coke Company than the creation of a municipal monopoly of both gas and electricity, and so denying to the inhabitants the advantages of active competition between the two. We say, too, better by far for the proprietors of the West Ham Gas Company to throw in their lot with the Gaslight Company than to submit the price to be paid for their undertaking, in the event of municipal acquisition, to the unknown results of an arbitration. The first speaker in the opposition also urged that, if the Gaslight and Coke Company wanted the West Ham gas undertaking, then let them buy it outright, with cash down. Those who dream of danger to their part of the capital, whether great or small, will find an ample supply of brokers in the City who will assist them to cut the painter, and get away gainers and not losers on the sum of their investments. One of the interesting points brought out in the informative address of the Chairman (Mr. J. Lister Godlee) on the subject of amalgamation is that one of the attaching conditions is that the price of gas in the Gaslight Company's district shall, no unforeseen circumstances intruding, be reduced to 2s. 8d. at the end of this year.

Gas in the East-End.

The Commercial Gas Company had an experience in the past year to which they have been strangers for many years; and that was a slight relapse in their growth. Nevertheless, they have during the year been engaged in broadening and making still more stable their basis by connecting up new consumers. Bearing in mind this fact, it indicates some extraordinarily abnormal condition, and that condition is a widespread depression in trade. When trade is bad, the East-end of London is made keenly aware of the fact; and the past year has seen more idle workshops and consequently migration of householders than is usually the case. The majority of people engaged in industry must live near their employment; and revival of trade ought soon to see the normal conditions of the district re-established. The East-end of London almost solely depends on industry and trade, and so consequently do the Gas Company. The cloud that has been hanging over commerce and industry shows no inclination to rapidly disperse; and, though to most of us the conditions are impenetrable, it is pretty safe to say that a change cannot be far distant—at all events, it is sincerely hoped it is not. Still the Company make a good financial and working showing for the past year; and it is a notable fact that in the three pioneer London Co-Partnership Companies—the South Metropolitan, the South Suburban, and the Commercial—the carbonizing returns for last year all show marked improvement. Among the interesting points of an altogether attractive address by the Chairman (Mr. W. G. Bradshaw) was the reference to coin-meter robberies in the area. They numbered last year 1775, or 325 less than the year before; and the Chairman sees in this diminution the deterrent influence of prosecutions for rifling the money-boxes. But robbery statistics from other districts do not prove that the punishment awarded for these thefts has had the salutary effect that Mr. Bradshaw believes to be the case in the East-end. A year's variation is hardly sufficient evidence to go upon to form any positive conclusion; but if the diminution of this particular crime continues, we would rather ascribe it to the small amount of money that rewards the thieves for the risk they run than to the reason advanced by the Chairman. The figures supplied by him attest a closeness of collection, and the efficiency of the Company's prepayment meter department. But we are sorry the figures were not carried farther, by the supplementing of the amount of the monetary spoil by the costs incurred in repairing the mischief wrought, and in aiding Justice when, fortunately, the plunderers are captured. The address included one of the most eloquent of the many tributes to the memory of Sir George Livesey, who took part at one time in the direction of the Company. As to the future, with a low capital account, the prospect of more reasonably priced coal and oil, with the increased and increasing connections to the Company's distribution system, and with a fair hope that trade depression will not endure much longer so acutely as in past months, the outlook for the Company is one that is by no means unsatisfactory.

The Livesey Memorial Fund.

The fund for the endowment of the Livesey Professorship of Gas Engineering and Fuel at the Leeds University now amounts to £7829. The leisurely flow of the subscriptions by Companies and Local Authorities owning gas-works is a matter that has been referred to somewhat frequently at meetings during the past week. The subject of local authority contribution was brought to the front at the meeting of the Manchester Institution by the President (Mr. J. W. Morrison) and the President of the Institution of Gas Engineers (Mr. Thomas Glover). The fund is to fulfil a double useful purpose. It is to memorialize the work of a great life; it provides for beneficial work for the whole of the gas industry in the future. Regarded in the latter light, contribution to the fund is an investment that will, it is said with confidence, yield a good return; and therefore local authority undertakings in subscribing to the fund will be merely laying out money from which they, in common with other undertakings, will derive advantage. Contribution by them can therefore be conscientiously looked upon as a legitimate expenditure; and if they want support for their action, they will find it in the contributions of Manchester, Birmingham, Glasgow, and other places that are anything but insignificant, and whose example in such matters as the one in question may well be taken as worthy of being followed. Mr. Thomas Newbigging, with his usual eloquence, also dealt with the question at the meeting of the Society of British Gas Industries on Thursday. The right given by half-a-century's work in administration in the gas industry to speak his mind on such a subject as this, has been used by Mr. J. Okey Taylor, at the meeting of the Reading Gas Company. The Company have contributed to the fund the (for a provincial concern of its magnitude) handsome sum of 200 guineas. The figure is testimony to the feelings of gratitude of all associated with the Company for accomplished work for the industry, and to belief in the value of the object to which the fund is to be applied. Mr. Okey Taylor spoke feelingly on the subject. The matter for greatest surprise to him is that gas companies have not responded in a more liberal manner. "It is," he also urges, "discreditable to certain companies that they have responded so niggardly to the appeal for this most important object." The time has long since passed when the fund should have been raised to its premeditated height; now let this be done quickly. One cannot read the speech of Professor Smithells at the meeting of the Society of British Gas Industries on Thursday without seeing in his words the pledge that the great trust confided to the Leeds University will be honoured both in spirit and by work. It is a serious responsibility to make the work worthy of the memorial; and this responsibility Professor Smithells and his colleagues gravely recognize in taking charge of it in conjunction with an Advisory Committee of the gas industry.

The Coalite Experiment at Plymouth.

Little has been heard of late respecting the coalite experiment at the Plymouth Gas-Works. For some reason which we do not profess to understand, neither the Coalite people nor the Gas Company have cared to say anything specifically about the work which they have in hand. Nevertheless, things appear to have

been making progress in a slow way. According to an obviously inspired paragraph which has appeared in the financial columns of some of the daily newspapers, the process of manufacture has actually begun, or is on the point of beginning. It would appear, however, that matters have not yet reached such a stage as to permit of a public demonstration of the working of the plant. This, it is understood, will come later. Meanwhile, we can only conjecture that the new installation, with the wide modifications from the original design which we foreshadowed, has proved more troublesome in erecting and getting to work than was anticipated. It is unnecessary to say that the results will be awaited with much interest. To the shareholders in the Coalite Company, success or otherwise of this experiment is a matter of supreme importance; while the gas industry, if not so immediately concerned, can scarcely look on with indifference, though other owners of gas undertakings may feel no desire to follow the example of the Plymouth and Stonehouse Company. A good many things remain to be proved by this Plymouth test as to the pretensions with which coalite has been launched. One question which has still to be answered is whether there is a remunerative demand for the fuel produced by the process. Steps are being taken to bring it to the notice of the people of Plymouth; and an office for its sale, when it is ready, is being opened in the town. As to other questions respecting the financial character of the new departure, it is satisfactory to know that in any event the Gas Company are on the right side. They will, no doubt, wish the partnership well, and do what is possible to make it a success; but if, unfortunately, things should go wrong, the Gas Company, at least, have nothing to lose. So far this is well.

Question of Supply Beyond Statutory Limits.

In another part of the "JOURNAL" will be found the report of a case which recently came before Mr. Justice Neville, in which the question at issue was the encroachment by one Water Company upon the domain of another. With the exception of the difference in the commodity supplied, the point in dispute was practically the same as that raised in the historical Nine Elms case. The proceedings were taken by the Attorney-General, at the relation of the Bristol Water Company, to restrain the West Gloucestershire Water Company from supplying beyond their statutory limits; and the facts were shortly as follows: Sir George White is the owner of Hollywood Towers, in the parish of Henbury, and his property adjoins the parish of Almondsbury, at Blackhorse Hill, where there is a road called the Causeway. In May last year he entered into an agreement with the West Gloucestershire Water Company for the supply of water to his property and the cottages upon it. The Company accordingly extended their main in Almondsbury to the boundary of their district at Blackhorse Hill, and thence continued it, at the cost of Sir George, for a few yards along the Causeway, in the parish of Henbury, to a certain spot on the roadside, where they put up a hydrant and a meter, and from the latter laid pipes to Hollywood Tower. This building being within the area of supply of the Bristol Water Company, as defined in their Act of 1872, though their mains had not been extended in Henbury so far as to reach it, they set the Attorney-General in motion to restrain their neighbours from supplying water outside their limits. Sections of the defendants' Special Acts were quoted in support of the contention that they were restricted to the "supply of water" within the area specified; and in the definition of these words the Nine Elms case was cited as being exactly to the point. It was submitted that the defendants were supplying water either at the meter or at the places where it was received by the consumer upon his premises, all of which were beyond their area. It was argued, on the other hand, that they were acting quite within their rights, as they delivered or "supplied" the water at the boundary of their district, at the point where their main was connected with that laid at the expense of the consumer. His Lordship came to the conclusion that the words "supply of water" covered its delivery for use at the terminals, wherever they might be, at which the consumer took possession of it, so to speak, and devoted it to his own use. He therefore decided that the defendants had exceeded their powers, and granted the injunction, with costs.

The Hygienic Properties of Gas.

It is, of course, desirable that everyone who is in any way connected with the gas industry should keep himself thoroughly posted up in the advantages of his own particular commodity as compared with rival systems of illumination; and, seeing the opportunities for acquiring this knowledge that are at his hand, there is no reason in the world why he should not do so. It is also necessary that he should be able, when called upon, to effectually refute statements with regard to supposed disadvantages which may be urged by competitors or others to attach to the use of gas. But though highly beneficial in the case of all who are engaged in connection with a gas undertaking, the possession of this knowledge is of absolutely vital importance to those who are on outdoor work or on duty in show-rooms—in fact, to every employee who is in any way brought into actual contact with present or prospective consumers. Such men must of necessity often have questions and arguments addressed to them which, if they are not really well informed as to what are the actual circumstances of the case, may place them in an awkward position, to the possible detriment of the business with which they are connected. On the other hand, if they are well grounded in the subjects that are likely to come forward for discussion in the course of their daily work, they will certainly be able to hold their own, and will have every opportunity of ultimately bringing doubters round to their own way of thinking. There is, of course, more than one point at which the gas advocate must be armed. For one thing, there is the question of cost as compared with other heating or illuminating mediums; but this is a matter which, with all the facts that are at command, is capable of fairly easy proof. Of equal, if not greater importance, however, is the hygienic aspect of the subject; for undoubtedly in some quarters on this score a good deal of prejudice still exists against gas, to overcome which needs a different kind of evidence from the ocular demonstration of the quarter's account. The London and Southern District Junior Gas Association is very largely composed of members who are engaged on the distribution side of gas undertakings; and this fact rendered specially appropriate to them the lecture which Dr. S. Rideal delivered at a meeting of the Association last Friday, on "The Hygiene of Gas Lighting." No doubt many of those present had previously read of the lecturer's investigations in connection with the matter; but even so the clear way in which he brought forward his various points must have done a good deal to impress them upon the minds of those to whom they were not absolutely new, while those who had not already studied the question were afforded quite a liberal education on, among other things, the advantages of gas as a ventilating agent and as a germicide, and the fallacy of supposing that its use under any ordinary conditions can be in the least degree injurious to health.

Thirty Shillings for an Accomplished Assistant!

There is a great deal of talk nowadays about the training of young men for appointments in the gas industry, and about the duty of those responsible for the administration of gas undertakings making official position in the industry one of attraction to men of brains. The Gas and Water Committee of the Ramsgate Corporation realize their duty in this matter in a superlative degree; and they know how to discriminate fairly between the remuneration of an unskilled labourer and a man highly trained and practised in engineering, in the making of estimates and drawings, in chemistry (gas and water), and in testing the efficiency of plant of all kinds. As payment for such a man, the Committee have determined that 30s. a week will be an adequate commencing salary! We dare not think what men who have the conscience to offer such a paltry and disgraceful sum would consider a living wage for an unskilled labourer. The unfortunate assistant who gets the 30s. a week, if he complies with the terms of requirement, will be a man worthy the esteem of his fellows for his many accomplishments. He is to be capable of keeping correctly and neatly all the books, &c., used in the Engineer's office, including the carbonizing book, coke analysis, wages analysis, monthly returns, Committee book, furnace and setting book, purifying book, &c. He is to be capable of accurately estimating for the laying of mains and services, fitting-up houses for either gas or water and for altering and extending the plants; and he is to be equal to the preparation of all plans, specifications, and estimating quantities required. A practical knowledge must be possessed of hydraulics, levelling, and use of the theodolite. Fully qualified must he be to make reliable analytical tests of all kinds in the gas and water departments, and efficiency tests of gas and water apparatus and plant. The salary offered is an

insult to the juniors of the gas and water industries; and the Gas and Water Committee of the Ramsgate Corporation have surely in this matter forgotten their own dignity. Municipal employment in official positions has dropped largely in estimation of late years; and such skinflint recompense as is offered in this instance can only result in drawing to municipalities the incompetents aspiring for service in the gas and water industries. No assistant with the accomplishments of the man they want at Ramsgate, and with any self-respect, will pander to such meanness by accepting service at the price.

THE LIVESEY MEMORIAL FUND.

We have received from Mr. Walter T. Dunn the following list of further contributions to the fund:—

1909.		£	s.	d.
Feb. 22	Amount already acknowledged . . .	5597	17	0
,, 23	N. W. van Doesburgh, of Leiden . .	1	1	0
	A. Clement Hovey, Milan	2	2	0
	Wellington (Salop) Gas Company . .	5	5	0
,, 24	Newark Gas Company	5	5	0
	Newmarket Gas Company.	7	7	0
	Wells Gas Company.	5	0	0
,, 25	Fred Gibson, Valparaiso	1	1	0
	Harold Iago, Shoreditch	2	2	0
	St. Albans Gas Company	10	10	0
	South Metropolitan Gas Company . .	2000	0	0
	Institution of Gas Engineers (Voted by Council from the Accumulated Surplus of the Birmingham Medal Fund)	105	0	0
,, 26	Whittington Gas Company	2	2	0
,, 27	H. D. Ellis, Commercial Gas Company	5	5	0
	J. R. Frith, Runcorn	1	1	0
	T. Goulden, Gaslight and Coke Company	5	5	0
	Charles Meiklejohn, Rugby	5	5	0
	Rugby Gas Company	26	5	0
	Runcorn Gas Company	10	10	0
Mar. 1	S. W. Durkin, Southampton	1	1	0
	Robert Fish, East Cowes	3	3	0
	F. A. Helps and Son, Stock Exchange	5	5	0
	James Kincaid, Kirkcaldy	1	1	0
	T. O. Paterson, Birkenhead	5	5	0
	Southgate and District Gas Company.	15	15	0
	Total	£7829	13	0

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 653.)

The general characteristic of things on the Stock Exchange last week was great sensitiveness and a quick change of mood, varying according as hopes or fears prevailed, or as the drift of opinion shifted this or that way. A feeling of apprehension lest rash action in the Near East should precipitate a catastrophe was a darkening cloud; and the disordered state of the American Market was another depressing factor. The opening was calm; but matters were soon disturbed by intelligence from the eastern and western worlds. All markets weakened—Consols falling $\frac{3}{16}$. Tuesday opened dull under the heavy influence of the day before; but more cheerful views prevailed later on, and things rallied fairly. Next day the wind was blowing again from the bad quarter, and flatness oppressed the markets in general, though some closing prices were above the worst. Thursday was uneven, variable, and highly sensitive. Consols fell, then recovered, and finally rose $\frac{1}{4}$. The Foreign Market oscillated up and down; and the American was much agitated. Friday produced a much improved feeling. Operators repurchased pretty freely, the gilt-edged division developed strength, Consols gained $\frac{5}{16}$, and the other leading departments showed firmness. This happier state of things continued through Saturday, which witnessed a general recovery, prompted by the improved phase of the Eastern question. In the Money Market, the settlement on the Stock Exchange and the month-end requirements wrought a good demand. Rates for discount were downward and closed easy. Business in the Gas Market continued brisk and cheerful, much upon the same lines as in the preceding week. The general tendency was firm and buoyant, and several quotations had some nice rises, while none receded. In Gaslight and Coke issues, the ordinary maintained its activity, with transactions ranging from 101¼ to 102¾—a rise of 1. The secured issues were quiet; the maximum making from 87¾ to 88½, the preference 105¼ and 105⅜, and the debenture 84¾ and 85½. South Metropolitan was very quiet but firm, and changed hands at from 120 to 121—a rise of 1. The debenture fetched 85⅛ and 85¼—a rise of ⅛. The only dealing in Commercial was one in the 4 per cent. at 108½. In the Suburban and Provincial group, Brentford "A" marked 244 *ex div.*, ditto "B" 191 *cum div.*, British 42¾, Ilford debenture 103, Tottenham "B" 107½ and 108 *ex div.* (a rise of 3½), and West Ham 117 and 117½ *cum div.* The Continental companies were very quiet. Imperial realized from 179 to 180½, ditto debenture 94 and 95, Union 102½, ditto preference 139 and 140, Malta 4¾, and Tuscan 9. Among the gas undertakings of the remoter world, Bombay changed hands at 5⅞, Buenos Ayres at from 13$\frac{31}{32}$ to 13$\frac{15}{16}$, Monte Video at 11$\frac{15}{16}$, Oriental at 140½, Primitiva at 6⅜ and 6$\frac{7}{16}$, ditto preference at 5$\frac{11}{16}$ and 5$\frac{13}{16}$, ditto debenture at 96¾, River Plate at 14 and 14¼, and San Paulo at from 14 to 14⅜.

ELECTRICITY SUPPLY MEMORANDA.

Diminishing Revenue from Private Lighting—Balancing the Loss—Doubtful New Sources of Revenue—Slow Meter or Decoy—Metallic Filaments and Meter Registration—Contest of the Lights in the City.

There is no use hiding the fact, as some station engineers are attempting to do, that the metallic filament lamps are causing a great recession in the amounts of the accounts of consumers, and that, in the aggregate, the sum represented is a very substantial one. Here and there a clean breast is made of the revenue reducing tendency of these lamps; and it does seem absurd to try to cloak the fact, as the joyful news of how to economize in electricity will—there is no help for it—permeate the private consumption stratum of the business. Publicity of the fact that the lighting revenue of undertakings is falling should be a good advertisement for metallic filament lamps, and possibly bring on more private consumers from among those who have been waiting for this happy time, or who are philanthropically inclined, and always ready to give a helping hand to those in distress. All electricity suppliers are not shy over the matter. From Hampstead, comes the news that there is not much doubt as to the revenue from private consumption having been hardly hit by the new metallic filaments. In the December quarter, the amount of revenue was down by £1770 compared with the same period of 1907; and this is "mainly attributed" to the introduction of the metallics. Warning has recently been given to the shareholders of the St. James' and Pall Mall Electric Light Company by their Chairman (Mr. Walter Leaf) that the substitution of the new lamps for old will undoubtedly continue, and "possibly at such a rate as to cause, for a time, an actual falling off of revenue." As a final illustration of the public recognition of the effect of the new lamps on revenue, the City Treasurer and the City Accountant of Dublin have jointly recommended that to meet certain additional charges that will fall upon the Electricity Department, and in view of the great reduction in cost of lighting effected by the new lamps, there should be a minimum average increase of ½d. per unit for private lighting for three years to March, 1912, and, indeed, that it would be advisable to increase the price at the start by ¾d. per unit. The Lighting Committee have reported that they are in agreement as to the advisability to, at any rate temporarily, secure a larger revenue from lighting consumers; and they, as an alternative, propose an addition of 10 per cent. on the lighting rates, which, on the 1908 accounts, is estimated to produce £3300. The Committee further advocate the abolition of the 25 per cent. allowance to new consumers, which was offered as a kind of wiring subvention, and, it is confessed, has failed in its object.

This proposal does not look healthy. It shows that the cutting into the private consumption by the metallic filament lamps is not being balanced at equivalent rate by the additions of new consumers. The new lamps are not doing the work that it was expected they would do in carving compensation from the fat backs of the gas suppliers; and our electrical friends must not ignore the fact that, by increasing the price per unit, they give favourable point to the already more economical competitor. But still we cannot see where the virtue comes in of increasing the volume of business done on an unremunerative price. Better keep to a small profit-bearing business, than increase the size, if as the size increases the financial position declines. Among our central station engineering friends, there are those, in residential areas, who tell us that the margin of their spare plant is growing, and that the amount of unproductive capital is consequently on the increase. That may be quite true; but it does not appear to us to be a particularly wise course to largely increase the capital expenditure in the district upon new consumers (upon which capital the usual charges have to be met) at unremunerative prices, or at an unremunerative amount of revenue per consumer, so as to give employment to plant and capital on which nothing is being earned. This sort of thing, instead of relieving the situation, only makes the financial burden greater. Is there any way in which the losses can be balanced? There have been several remedies proposed; but the age of miracles has now passed, and there is no one-day cure for such troubles as those from which a number of electricity undertakings are suffering. All districts are not industrial ones, and power loads of sufficient importance to be of real service cannot be obtained. The "Electrical Times" has

shown a genuine benignity for the undertakings whose prospects are the most hopeless through their incapacity for developing a profitable day load. "Meteor," who writes in our contemporary, appears to be a pretty regular reader of the "Memoranda;" and only lately he has promised not to give what his buoyant imagination conceives to be offence to us in respect of a certain matter. Perhaps the promise will cover the present request that he should hide his blushes when we say that, among the technical papers, the "Electrical Times" has been most fertile in suggestions for the relief of the distressed electricity undertakings in unresponsive areas. There have been the suggestions in our contemporary that one way of balancing the loss is by obtaining new consumers mainly by cheaper methods of wiring, and another by altering the system of tariff at present in vogue. But these ideas have had a mixed reception, and have not done anything to expedite relief. Our sanguine contemporary, however, assures us that the good time is coming when more will be heard of their effectiveness. Increased business, it is thought, must be had at any price, and that quickly. Now there is the third proposal that new sources of revenue should be tapped. To tap this new source, however, the much-abused principle of making price dependent on the value of the load factor must be finally jettisoned.

What are these new sources of supply that it is suggested shall be tapped? It is the supply of such things as flat-irons, two and three pint kettles, and cooking outfits—an old idea that has caused much sickening of heart to many central station engineers. Experience with these things is, in many places, that they are more nuisance than they are worth to the consumers; and electrical engineers have been heard to anathematize them. It must be especially disheartening to them in a district in which artizan dwellings are predominant to see gas-cooking stoves comprising baking, boiling, grilling, and toasting conveniences (requiring only the ordinary, and not special and high-priced, kitchen ware), going in by the hundred—aye, and by the thousand—in a single half year, when they can themselves only offer a 13 inch by 14 inch by 15¾ inch oven that costs £7 10s.; flat-irons that cost 15s. and more; and two and three pint kettles that cost 10s. and 15s. apiece. The cooking outfit at £7 10s. (this is without installation costs) will, we are informed—under refined conditions to which it is subject by the manufacturer, and not the everyday conditions of the kitchen—cook a 4-lb. joint of beef, bake 2 lbs. of potatoes under the beef, bake one apple tart, boil 2 lbs. of vegetables, and also 2 pints of water with a consumption of 1781 watts, or (say) 1¾ units, and 95 minutes are absorbed in the operation. It is remarked that the engineer in charge of the oven, thirty minutes after starting up, takes off the first heater, at 40 minutes the second heater, at 60 minutes switches on the second heater; and in the intervals attends to the food that is being cooked. What will happen if these things are not religiously attended to, we are not told. The 3-lb. flat-iron will consume about 300 to 500 watts per hour; 1½ and 2 pint kettles also require 400 and 500 watts, and boil in from 11 to 14 minutes; and a polished copper 2-pint kettle will take 800 watts. On consideration of such cost and consumption figures, we think the flow from the "tapping" of these "new sources of revenue" will not be a particularly strong one—certainly not sufficient to replace the much-needed diminutions of 50 per cent. or so that are reported in some electricity consumers' bills, through supplanting carbon filament lamps by metallic filaments.

Not half-a-dozen miles from Charing Cross, there is a tradesman who uses gas lighting in his business; but he has recently been persuaded to allow the local electricity suppliers to put in, by way of trial, four 32-candle metallic filament lamps on the terms of 5d. per unit, with a 10s. minimum per quarter. The lamps have only been in use one complete quarter; and on the consumer being told that the consumption for the quarter had not reached the minimum, so that there was only 10s. to pay, he at once began to revolve in his mind the expediency of having another cluster of four lights fixed. But he happens to be still considering the point, as he has his doubts as to whether, when he has eight 32-candle lights going, a winter quarter's consumption will show an account of less than £1, as it should do if the minimum of 10s. has not been exceeded with four lamps. Last quarter this observant waverer between metallic filament lamps and incandescent gas lighting, kept a rough account of the number of hours he had the four lamps in use; and the average was—remember it was the Christmas quarter—27 hours per week, or 351 hours in the thirteen weeks. The four 32-candle power metallic filament lamps, reckoning 1·25 watts per candle power, would use 160 watts per hour, which multiplied by the 351 hours' use in the quarter would equal 56 units for 128-candle power. These 55½ units at 5d. would cost £1 3s. 4d.; but the electricity meter reader, much to the delight of the consumer, says the 10s. minimum has not been exceeded! Is the meter running slow, or is this a decoy installation? We cannot reconcile the hours' use with the consumption working out to under the minimum. For a little more than 2000 cubic feet of gas a quarter (351 hours' use) in the case of this shop, a light of 128 candles could be maintained; and gas in the district in question is only 2s. 3d. per 1000 cubic feet.

As to meter registration with metallic filaments, some consumers are getting interested in the knowledge that all electricity meters are not of the order of the sensible gas-meter, which will go on registering volume no matter how small up to the maximum capacity, and without any consideration as to the use that the gas is put to. Certain electricity consumers, who have had transformers put in, and metallic filament lamps installed throughout their dwellings, have given a violent shock to the purveyors of electricity by the rapid descent of the quantity of current registered. The complete contentment of the consumers at the success of their costly change has been short-lived; for the visit of the meter inspector has been promptly followed by an intimation from headquarters that, a change from carbon filament lamps to metallic filament lamps having been made, a more sensitive meter will have to be introduced. Well, the consumers concerned are very happy without the more sensitive meters; but they suppose right is on the side of the sellers of the current, though it is somewhat of a mystery to them, being laymen in these matters, why their old meters should entertain such antipathy, so human-like, to the new-comers; and why the old meters should be endowed with the power of discrimination so that they know when the current is being used for metallic filament lamps, and not carbon filament lamps, in the use of which there has been variable consumption according to number employed. Householders at one time credited gas-meters with being fearfully and wonderfully made; but they are saying things now about electricity meters that are not altogether complimentary, and especially after a few consumers have been comparing notes.

The little game between the Electricity Companies and the Gaslight and Coke Company in the City is proceeding merrily. As was mentioned just recently, the new high-pressure inverted gas-lamps in Fleet Street gave the electricity suppliers such uncomfortable feelings that they rushed at once, and supplanted, by flame arc lamps, in Ludgate Circus and on Ludgate Hill, the old arc lamps that had been permitted to continue in service until they bore quite an effete appearance, and showed that there were exceptions to the proverbial rule as to the survival of the fittest. While these wasters and incompetents have been surviving, gas has been making headway; and, at the eleventh hour, the City of London Electric Supply Company have found it is necessary to show a little more life and interest in the public lighting, rather than hang on to the £26 per lamp that they have been receiving under some ancient contract. The three flame arc lamps in Ludgate Circus that were opposing one inverted gas-lamp have not been allowed to continue long without having forced upon them the companionship of four new inverted gas-lamps of the high-pressure type. The new lamps are hung from swan-neck brackets supported by columns; and they look well—being situated one at each corner of the circus. Our electrical friends who have been following on the heels of the Gas Company at every fresh move, while not taking any initiative on their own account until forced by the successes of gas, will not like the Gas Company making such prompt reply to their ineffectual attempts to discount, by grouping flame arc lamps, the new advances of gas lighting. It is a merry game; and gas is not to be subdued by the electrical companies' meretricious instruments, fed with electricity at the low price of 1d. per unit in order to bring the charges, but not the actual costs, down to £17 10s. per 11-ampere lamp.

PERSONAL.

Mr. A. E. MILLWARD, who acted as Clerk of Works for the Accrington and District Gas and Water Board in connection with the sinking of a new well and the erection of a pumping-station at Altham for that authority, has received from the members of the Board a testimonial expressing satisfaction at the way in which the work has been carried out. The testimonial is signed by the Chairman and the Clerk of the Board.

Mr. CHARLES NICKSON, the Superintendent of the Manchester Corporation Gas Department, celebrated his eightieth birthday, on Saturday, and was the recipient of many hearty congratulations, to which we cordially add our own. In noticing the event it may be mentioned that Alderman GIBSON, the Chairman of the Gas Committee, was 77 years of age last Thursday. He has been a member of the Committee for more than 25 years. Some statistics showing the progress of the undertaking during Mr. Nickson's superintendence will be found elsewhere.

Northern Star Lodge.

The Installation Festival of this lodge was held at the Midland Hotel, Manchester, on Friday last, when W. Bro. Wm. Batt, the Senior Warden, succeeded W.Bro. Robert Surtees as Worshipful Master. Subsequently, the following officers were duly installed by the incoming Master: Bro. John Mackay (Bradford), S.W.; Bro. G. B. Smedley (Swadlincote), J.W.; W.Bro. J. W. Scott (Stockport), Chaplain; W.Bro. Walter Whatmough (Heywood), Treasurer; W.Bro. R. G. Shadbolt (Grantham), Secretary; Bro. H. Barker (Buxton), S.D.; Bro. Fred. J. West (Manchester), J.D.; W.Bro. Wm. Prince (Stoke-on-Trent), D.C.; Bro. T. W. Jordan (Stockport), Organist; Bro. S. Meunier (Stockport), I.G.; Bro. James M'Ewan (Manchester), Bro. S. E. Halliwell (Littleborough), Bro. E. O. Watson (Rawmarsh), Bro. E. J. Wellens (Hebden Bridge), Stewards. Afterwards, W.Bro. S. R. Ogden, one of the Past Masters of the lodge, was appointed Charity Representative; and £5 was transferred from the Lodge Charity Fund to the East Lancashire Systematic Masonic Educational and Benevolent Institution

ROUND THE WORLD—AND SOME GAS-WORKS.

By Maurice Graham.

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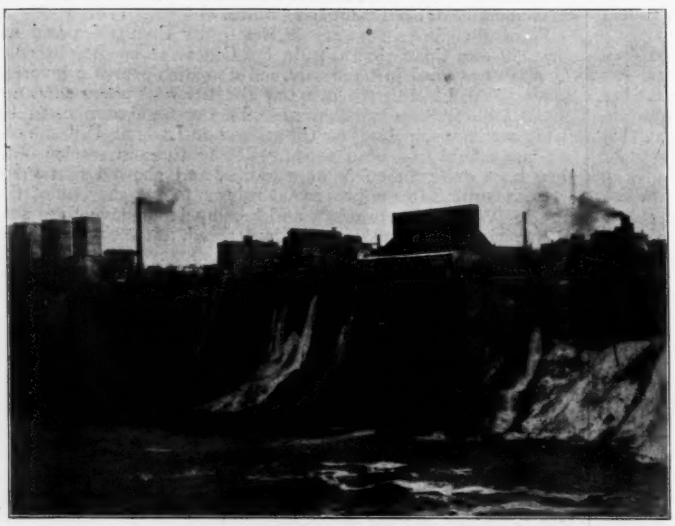
XXIII.—IN EASTERN CANADA.

From Toronto to Niagara Falls is a railway journey of about two hours, and the fascination of the Falls was too great to allow the writer to pass them by without once again seeing them. On the way, the town of Hamilton (Ontario) is passed. It is a flourishing port on Burlington Bay, at the west extremity of Lake Ontario. It possesses excellent water and gas works; but there is keen competition with both electric light and natural gas.

NIAGARA FALLS.

This town now has a population of 30,000 people, who are all employed in the many factories driven by the electric current generated by the Niagara Falls Power Company (the largest) and other companies. It is computed that the average flow of water in the Niagara River is approximately 222,000 cubic feet per second; and the kinetic energy of this volume falling through the total distance of 300 feet, it is estimated, is capable of developing 7,500,000-horse power. The falls themselves have a drop of only 165 feet; but the variation in level from the river above to the lowest point below the rapids is some 300 feet. The Power Company have a total output of 220,000-horse power, including recent extensions. In addition to this, there are several other companies on the banks of the river; but the whole power utilized does not exceed 4 per cent. of the vast energy available from the Niagara River.



Photograph No. 191.—A Mighty Power—Showing the Sluices from the Various Power-Houses on Niagara River.

Until 1890, the Niagara Falls Gas Company were the sole source of the light, power, and heat for distribution, as they had been for about thirty years. The scene, when looking from the Canadian side of the falls, is one of striking contrast; for the little gas-works, which are built at the end of the Niagara Suspension Bridge, seem to be battling for their very existence with the enormous Electric Power Companies surrounding them. Photograph No. 191 is an illustration of these great power works, and shows the sluices from the various power houses; while, in contrast, in Photograph No. 192 are seen the diminutive works of the Niagara Falls Gas Company. The ground was covered with snow when the writer wended his way through these little gas-works, which are only 250 yards from the American Falls. There is nothing of interest to describe about the small plant, which provides consumers with gas for heating and cooking purposes; the Company having a goodly number of customers who prefer gas to anything else for such purposes. The Gas Company's offices are in the main street; and a neat collection of gas-fittings is there displayed. Further particulars about this Company could not be obtained.

MONTREAL.

The journey to Montreal was through most interesting country, which is well cultivated, and was like the scenery in England; the farms being divided into small fields, with either hedges or wooden fences as boundaries. The weather was bitterly cold, and snow was falling.

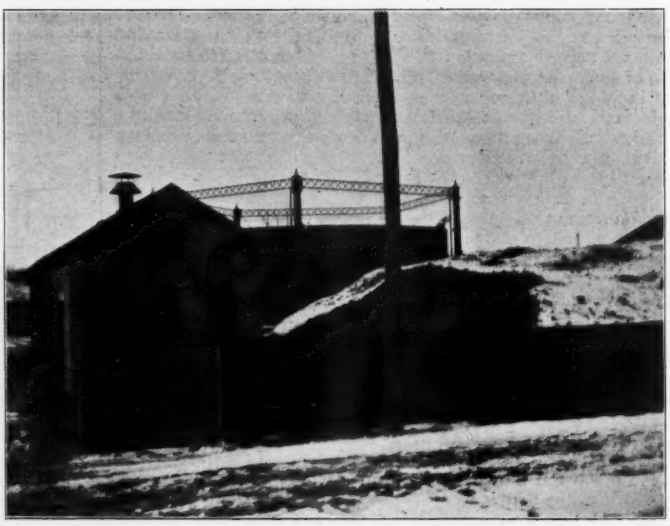
At Montreal, it was found that the language most spoken in the city was French; all notices, &c., being put up in both English and French. The man in the street, it seems, speaks French for preference, and English when obliged. The ground being by this time covered with thick, hard snow, ordinary wheeled vehicles were of no use, and gave way to the snow sleighs, the jingle of the bells of which, to one not accustomed to it, was simply delightful. Driving in these conveyances is very comfortable and warm, with skin rugs.

After a tour round the city, a visit was made to the gas-works, where the writer had the pleasure of an interview with Mr. Murray, who was formerly in the gas-works at Birmingham. This gentleman informed the writer that it was the wish of the Secretary of the Gas Company that a description of the Montreal Gas-Works should not appear in the "Journal of Gas Lighting" at present.

The writer, in passing through the works, noticed that there was a complete reconstruction of the plant going on, from retort-house and hot-coke conveyors to the large gasholder just [November, 1908] being completed by Messrs. C. & W. Walker, Limited. No doubt when all the plant is running smoothly, Mr. Murray will favour readers of the "Journal" with a full description of the work he has been doing during the last eighteen months.

QUEBEC.

A more fruitful reception awaited the writer when he visited the Quebec Gas Company. Proceeding in a sleigh from the railway station to the famous Château Frontenac Hotel, one gets a good view of this ancient city, with its marks of past sieges and bygone troublous times. Its present population numbers 75,000, composed chiefly of French Canadians. Histories in many volumes have been written concerning this picturesquely situated French Canadian settlement; but the present writer is going to deal with a subject that all previous historians have missed—the gas-works. A short description of them lately appeared in the "Journal,"* enumerating the work that had been completed; so this article may be regarded as the complement of that one.



Photograph No. 192.—The Small Gas-Works at Niagara Falls.

Mr. Robert A. Wallace is the Engineer and Manager of the Quebec Gas Company. He was formerly at the Hamilton Gas-Works, previously mentioned in this article. The writer had the pleasure of meeting him at the gas-works, and, after a few minutes' conversation, a tour round them was made, which revealed a wonderful transformation in the plant formerly existing.

The original Gas Company was formed in 1849. It has lately passed into new hands, which entered upon a scheme of reconstruction so as to cope with an opposition Gas Company that appeared upon the scene. The works' area is about four acres; and there is not any available ground for future extensions on the site. The problem has been to make the best possible arrangement of plant with a limited amount of capital to spend, and it

* See "Journal," Vol. CIII., p. 532.

has been solved in a remarkable manner. The writer regarded everything from the practical point of view of working efficiency, discarding all question of lavishness in ornamentation, as such, even if desirable, was impossible with the amount of money available.

Quebec Gas-Works.

The retort-house has eight beds of sixes; the retorts being singles, 9 ft. 6 in. long. They were built by Messrs. R. Dempster and Sons, Limited, of Elland, on their regenerative tube system. The retorts were drawn and charged by hand, although a Biggs-Wall overhead charger has been installed, and will shortly be put into operation. The charges weigh 412 lbs. per retort, and are well burnt off in six hours. The fuel consumption was 16 lbs. of coke per 100 lbs. of coal carbonized. The gas made per bed and per twenty-four hours was 50,000 cubic feet; so that the productive capacity of the retort-house is 400,000 cubic feet. This is with American coal; but that used at present [November, 1908] is Pelaw Main, Durham, which costs 17s. 8d. per ton delivered at the gas-works.

Stokers' wages are 8s. per eight-hour shift, and 9s. for a leading stoker. Labourers in the yard get 7s. for ten hours.

The coke produced was clean and big, and fetches 28s. per large ton at the works.

Passing to the condensers, one sees two new water-cooled gas condensers, each 5 feet diameter and 19 feet long, with 170 lap-welded tubes of 2½ inches diameter. These condensers are capable of cooling 800,000 cubic feet of gas per twenty-four hours. In addition, there are six annular condensers, which increase the efficiency of the cooling plant. All these are under cover to protect them from the very cold weather.

There are two Beale type rotary exhausters, with engines coupled direct, having a capacity of 25,000 cubic feet per hour each.

A suitable building covers a new Walker purifying machine, with engine and fittings complete, capable of dealing with 800,000 cubic feet of gas per day.

Then comes the purifier-house—formerly, and even now partly, a gasholder-house—with a stage-floor supporting four boxes, 20 ft. by 20 ft. by 5 ft., with dry-sealed covers, having Messrs. C. & W. Walker's (Milbourne's patent) fasteners and fittings, as seen in Photograph No. 193. Oxide is used exclusively for purification, and is elevated from the floor below to a hopper above, from which the boxes are filled.

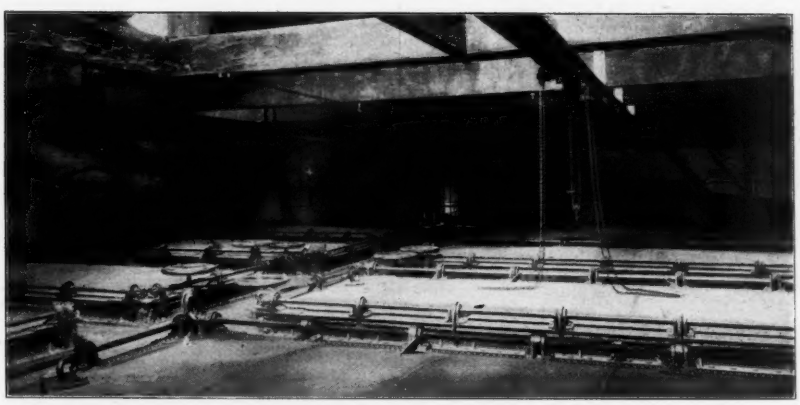
A Wooden Gasholder Tank.

Adjoining, and in the same building, is a gasholder. This proved a very interesting piece of plant, especially as the tank was made of wood and was erected fifty years ago. When inspected last year [1907] it was found to be in very good condition and required but little attention. Formerly, there were two gasholders in this one house; but one of them was taken down to make room for the above-mentioned purifiers. The old tank was retained, and is used as a tar-tank; and it is over this that the new purifiers were erected. So the writer has seen a circular wooden purifier box at San Francisco (as previously described) and a wooden gasholder tank at Quebec.

There are three gasholders—one of 25,000 cubic feet for water gas, and two of a combined capacity of 210,000 cubic feet for coal gas. They all have outside guide-framing, and are all enclosed in buildings as a protection for the water.

The meter-house contains two of Marsh's rotary meters—one of 30,000 cubic feet per hour for coal gas, the other of 15,000 cubic feet for water gas.

The water-gas plant was erected by the Economical Gas Apparatus Construction Company, Limited, of Toronto and London, and has a productive capacity of 250,000 cubic feet per day. It is of great service in case of emergencies, and is valued as a reserve apparatus or stand-by.



Photograph No. 193.—The Purifiers at Quebec, with Messrs. C. & W. Walker's (Milbourne's Patent) Covers and Fasteners.

The annual make of gas of the works is 100 million cubic feet; while the maximum daily output is 360,000 cubic feet.

As regards working up the bye-products, there is a small concentration plant for the ammoniacal liquor; and tar sells at 2½d. per gallon at the works.

Mr. Wallace is making alterations to the works' offices and stores, and putting them into businesslike order, as if he meant to exterminate the opposition French Gas Company, who are at present waging war upon his Company. It seems as though it is to be a fight to a finish, as there is not room for two Gas Companies in the city; so the weaker will have to go to the wall.

In the present Manager, the Quebec Gas Company have the right man at the head of affairs at the works, and one who thoroughly understands the smallest practical detail required not only in manufacture, but in distribution as well. The writer had an opportunity of observing the general organized system in this besieged gas-works, so to speak, and has no fear as to the result of the rate war, with Mr. Wallace as technical commander.

Administration and Distribution.

A visit to the well-equipped offices and show-rooms of the Gas Company in the town gave the writer the pleasurable opportunity of seeing Mr. C. E. Carr, the Managing-Director of the Company. This gentleman attends to the financial end of the business, and is wide awake to any kind of improvement which might be adopted by the Company, so as to give the consumer better light at a cheaper rate, and at the same time bring additional profit to the Company. Neither on the administrative side of affairs need there be any fear as to the outcome of the warfare with the competitive Company.

There are about 35 miles of mains, which are laid at an average depth of 3 ft. 6 in. from the street to the top of main. All the street-mains are of drawn steel tubes, and are jointed by the "Dresser" coupling, which is a style of coupling largely used in America. Some of the pipes have been laid with a view to their being converted into high-pressure mains in the future.

The public lighting is all done by electricity, the supply of which is in the hands of two Electric Companies, between whom there is keen competition.

The standard illuminating power of the gas is 17 candles, and its price is 4s. per 1000 cubic feet. The number of consumers is 3500; but no doubt this will soon be augmented.

There are no meter-rents nor charges for connections. All house meters are dry, and 300 slot-meters are in use at present, and more may shortly be expected, as the sale of these is to be pushed in future.

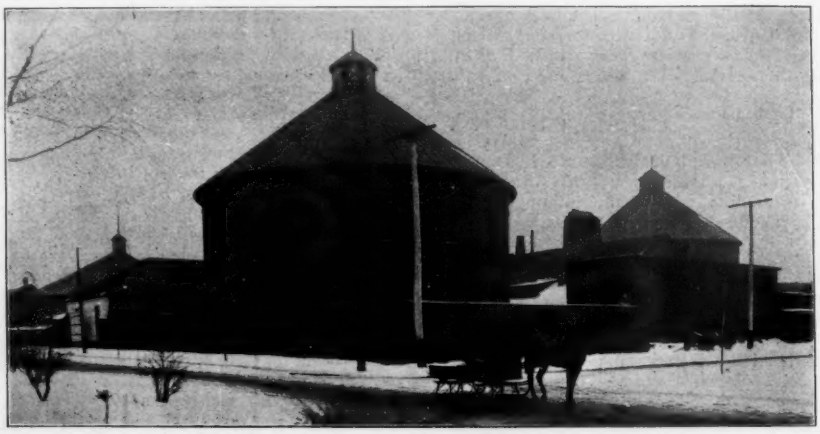
Of gas-cookers and heaters, there are 1560 in operation; and these also will be largely added to. So, too, the Gas Company intend to enter the competitive field with their gas-engines as against the motors of the Electric Companies.

With all this organization and enterprise, it is not surprising to learn that the last twelve months showed an increase of 50 per cent. in the gas consumption. With this good and encouraging sign in mind, the writer bade good-bye and good luck to Mr. Carr and Mr. Wallace in their plucky fight.

OTTAWA.

Jumping into a sleigh at the Hotel Frontenac, Quebec, the ride to the railway station was only a question of a few minutes, and the mail train was soon speeding on its way to Ottawa, the city that has now the honour of housing the members of Parliament in a group of beautifully designed buildings. The population of this city is 80,000; but it cannot be said to be increasing at all rapidly—in fact, it has come almost to a standstill, or at least has only a small annual increase due to the birth rate rather than to any influx through immigration. The scene was wintry and pleasing. In this eastern part of Canada the snow lies thickly, and on the thoroughfares is trodden down, forming a frozen layer upon which the light and heavy traffic sleighs.

Through the kindness of Mr. John Coates, M.Inst.C.E., of London and Ottawa, the writer had the opportunity of making a tour of the city and suburbs, of inspecting the exteriors and interiors of the principal private and public buildings, and of listening to Mr. Coates' eloquent descriptions of the many places of interest,



Photograph No. 194.—General View of the Ottawa Gas-Works, with the Three Gasholder Houses.

not forgetting the important industrial concerns, including the enormous lumber trade abounding on the magnificent Ottawa River passing through this capital city of Canada.

"Freezing Out."

The Ottawa Gas Company have lately become affiliated to, and controlled by, the local Electric Light and Power Company. So they are to be added to the list of many other gas companies in Canada which have lost their individual control over private and public lighting by gas. This general absorption is one of the greatest blows that gas has sustained throughout its industrial career, and is due, of course, to the force of circumstances in that there is an enormous supply of energy going to waste in the many waterways that abound in Canada, and to which the electric companies can help themselves merely for the asking. There is here no question of equal competition for both illuminants, starting from one fair and common basis; so that the illuminant in possession of the natural key to solve the problem becomes an easy winner.

The "freezing out" process in vogue in Canada appears to have come over the Canadian border from the States. The term is quite American, and is largely used in that country as well as in Canada. It is certainly applicable to the methods adopted by various electric light and power companies, who, having cheap water power at their backs, cut down the sale prices of electric light so low that gas consumers leave gas, at least so far as illumination goes, for the cheaper and more abundant electric light. This is what is known as "freezing out," though it might equally be called "cutting" or "starving out."

When this time came in the case of the Ottawa Gas Company, and the Electric Company took control, Mr. John Coates rightly decided to retire gracefully from the unequal combat, before any money had been futilely lost in attempting to fight an invincible foe. Mr. Coates is a man who has had large experience, as a gas and hydraulic engineer, in London, Australia, and Canada. He has been the founder of over forty gas companies at home and abroad; and he took the Ottowa Gas Company under his general management sixteen years ago. At that time, it may be added, the unaccounted-for gas of the Ottawa Company amounted to 40 per cent. of that passed through the station meter; but at the time of his resignation from the Company, about two years ago, it had been reduced to 9 per cent.

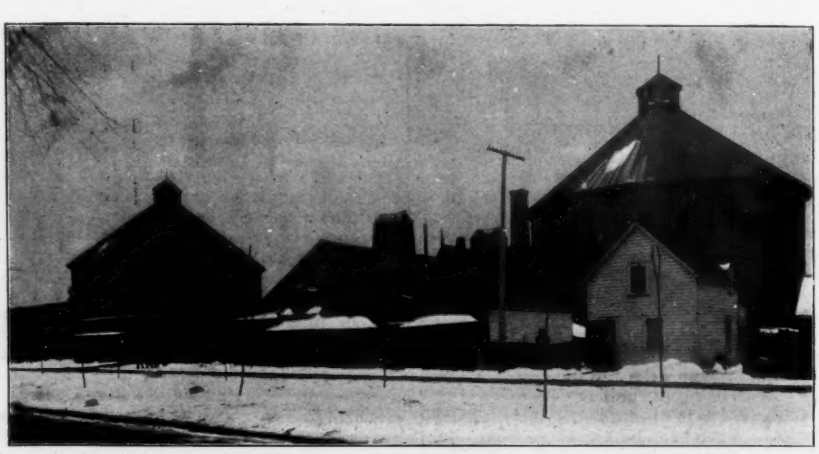
Ottawa Gas-Works.

The present Manager of the gas-works is Mr. Charles Forbes, who has now the control of the gas department of his Company; and it was through his kindness that a visit was made to the gas-works and the following information obtained. And here a word may be said as to the necessity of always bearing in mind the varying conditions and requirements of all the different gas-works visited. When inspecting or viewing gas-works in various lands and climates, it is essential to have the views of the experienced men on the spot, who, being residents, can give information as to the why and the wherefore of decisions to have had things done as one sees them at the moment of the visit. It is also advisable to keep one's ears open and one's mouth shut until towards the end of the interview; otherwise the opinions received may not be unbiassed, and the impressions formed on both sides may be erroneous. Neglect of these precautions led to what happened some time ago, when an engineer inspecting these works based his report on English methods and preconceived ideas only. Where do we in England have gasholders located in brick houses, or mains laid 5 or 6 feet deep, or have to contend with a temperature fluctuating from 75° Fahr. in summer to 50° below freezing point in winter?

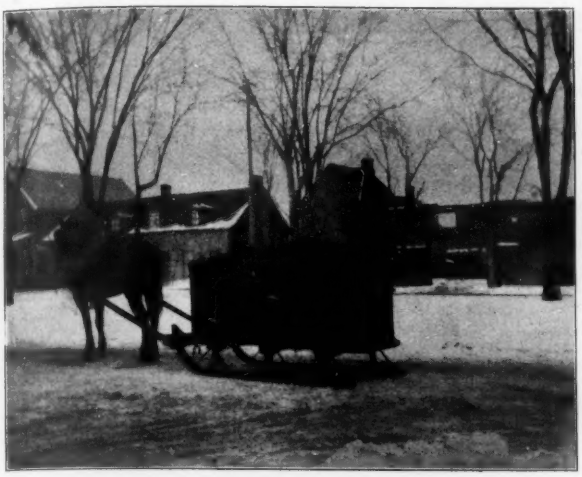
The gas-works were established in the year 1866, and have since been gradually improved on methods suitable to the climatic conditions. Turning down one of the central streets in the city, three round brick buildings, with steep conical snow roofs, are first of all seen, as appearing in Photograph No. 194, and surrounding them are structures sufficiently strong to withstand the heavy accumulations of falls of snow. There is no pretension to originality; but strength and suitability are attained. The area of the works is about 8 acres, including several blocks of workmen's dwellings. The works are lighted throughout by electric light; Mr. Forbes having given his Electric Company the contract to light them at a cheaper rate than by gas.

The coal is brought to the works by cart in summer and by sleigh in winter, and is stored under cover to the extent of 2000 tons. It is the ordinary Pennsylvania coal that is mostly used in Canadian gas-works. From the coal-stores to the retort-house barrows are used.

The retort-house, which is seen in the middle of the front view of the works shown in Photograph No. 195, contains seven beds of sixes, ⏀-shaped, 9 feet long by 28 inches by 16 inches, built on the shallow recuperative system by Parker-Russell, of St. Louis, U.S.A. The heats were splendid; and the charges of 350 lbs. were well burnt off in four hours, with a fuel consumption of 16½ lbs. of coke per 100 lbs. of coal carbonized. There is no machinery of any description; everything being done by hand. The stokers' wages are 8s. 7d. per shift; and one man charges, draws, fires, and clinkers a complete bed during his shift of twelve hours.



Photograph No. 195.—Front View of the Ottawa Gas-Works, with the Retort-House in the Centre.



Photograph No. 196.—An Ottawa Coke-Sleigh.

The coke commands a ready sale at 23s. per ton. Mr. Forbes has created a good market for coke, owing to pushing the sale of it for use in combustion stoves. He has the coke screened and sized and put into bags to suit his customers' individual weekly requirements. An illustration of a coke sleigh is given in Photograph No. 196.

The battery of annular condensers is under cover; and other apparatus consists of three rotary exhausters, a Livesey washer, one "Standard" washer-scrubber by Messrs. Kirkham, Hulett, and Chandler, and a tower scrubber. The Whessoe Foundry Company, of Darlington, made and erected the four 16-feet square purifiers, which have water lutes and are filled with oxide of iron. None of this plant calls for any detailed description.

In a separate building are located a circular station meter, and Parkinson's improved governors.

The three gasholders are in self-contained buildings. The buildings are heated by steam, and the holders have no guide-framing except the heavy brick piers, which take the place of standards. The total capacity of the holders is 465,000 cubic feet, which is about equal to the maximum daily make of the works, the annual output of which may be stated at 150 millions.

Water gas is used when the price of oil permits, but at present [November, 1908] only as a stand-by in case of need. There are two sets of plant by the Economical Gas Apparatus Construction Company, each able to produce 250,000 cubic feet of gas per twenty-four hours.

There is a small ammonia concentrating plant, and a small tar-still on the works, both of which handsomely repay the cost of their installation. The price of tar is 1¼d. per gallon, and pitch varies from £2 to £3 at the works.

Horses v. Conveyors.

Before finishing the description of the works, it should be said that the whole of the carting for the Gas Company is now done by themselves; and this was cited as being an improvement on the former contracting-out system. The writer is inclined to differ somewhat on this matter, as he has seen instances in gas-works where the carting department has been greatly abused, and where it would handsomely pay the gas company to dispense with the stables and have a competitive contract price per ton for all the carting required. One instance is in the writer's mind where elaborately fitted-up stables, equipped with all the latest horse appliances and accommodating over 120 horses, and involving an up-keep, it is said, of about £5000 per annum, are installed on a gas-works, all to cope with the maximum amount of work which comes at rare intervals, as at coal unloading time. Heavy, thoroughbred, prize animals can be seen pulling about tiny trucks that a little Japanese would be ashamed to say he could not push with one hand. Surely, the engineer who calls in the service of horses and carts to do what any ordinary system of conveying machinery can accomplish at 1d. or 2d. a ton is underestimating his engineering capabilities and mechanical resources. Of course, this does not apply to Mr. Forbes at Ottawa; and the writer does not in any way wish to criticize the small gas-works' stable there. But the subject presented an opportunity of mentioning a wasteful system that in fact, in some cases, exists.

Notwithstanding the fact that the gas department is requested not to push the sale of gas for lighting and power purposes, as these requirements can be served by the electrical department, there is a 20 per cent. increase on the sale of gas as compared with the previous year.

Both departments have their show-rooms in a main thoroughfare in the city. The gas offices are in one building and adjacent are the gas show-rooms, exhibiting, chiefly, varieties of cooking and heating apparatus. The electrical show-room is also well fitted up, and displays all classes of electric fittings and motors of all sizes suitable for factory purposes.

The length of gas-mains extends to 60 miles; and their average depth is 5 feet from the road surface to the top of the main.

The illuminating power of the gas sent out is 17 candles, and its price is 4s. 5d. net per 1000 cubic feet.

Out of the 80,000 inhabitants, there are 6000 gas consumers; and some 5000 gas cookers and fires are at present in use. As Mr. Forbes, however, has this field allotted to him to attend to without competition, he hopes, by his efforts, considerably to increase this number. Of the present consumption, 90 per cent. is for cooking and heating.

In conclusion, the writer was informed by Mr. Forbes that it is intended shortly to build complete new gas-works at Ottawa, as it is found that, with the present rate of increase, it will not be possible to cope much longer with the demand for gas. So here, again, is afforded another instance of the great vitality of gas, even where it labours, in some particulars, under a very heavy handicap.

With renewed thanks to Mr. John Coates and Mr. Charles Forbes for their kind welcome and willing information, the writer said farewell to Canada, and journeyed on to New York.

MR. O'CONNOR'S THIRD LECTURE.

On Monday evening last week, Mr. Henry O'Connor, Assoc. M.Inst.C.E., F.R.S.E., gave the third of the series of Keith Lectures on "Gas Manufacture and Lighting," which he is delivering to the Royal Scottish Society of Arts, Edinburgh. The chair was occupied by Mr. W. R. Herring, the Gas Engineer to the Edinburgh and Leith Gas Commissioners.

The lecturer began by a study of the heating of gas-retorts; reference being made to the earlier or open-hearth system, wherein twice the quantity of air has to be drawn in to ensure complete combustion, and upwards of 50 per cent. of the heat passes up the chimney. The system of gaseous firing introduced by Sir William Siemens, whereby the heat of the waste gases is utilized, was fully described; and the chemical changes taking place between the carbon of the fuel and the oxygen of the air were clearly explained. The amount of oxygen per pound of carbon, and the air necessary to provide this oxygen, were detailed, together with the composition of the gas at the various stages. The heat energy generated and distributed was also mentioned. Retort-house governors, the process of condensing the gas, and the rotary exhausters for drawing it from the retorts, were the next subjects dealt with. The methods employed for the removal of the tarry vapours, ammoniacal liquor, and some carbonic acid and sulphuretted hydrogen, and the projects for the elimination of these impurities in closed vessels, were described. The processes for obtaining nitrogen from the coke and the final removal of the impurities from the gas by means of lime and oxide of iron, the newest forms of grids—such as the Jäger, the "Standard," and the "Hurdle"—with all the chemical changes taking place during purification, were fully examined. At each stage of the processes, analyses were given of the gas, showing the variation in its composition. The construction and action of the station governor, which regulates the pressure upon the town, and its compensation, were described; and the method of enriching gas by means of benzol was explained.

Last night's lecture was devoted to lighting and heating, which will form the subjects of the concluding lecture next Monday—specimens of the latest types of apparatus being shown.

International Electrotechnical Commission.

At the recent Council Meeting of the International Electrotechnical Commission, which was opened by Mr. A. J. Balfour in October last, the question of an International Unit of Light was brought forward by the French Electrotechnical Committee. The proposition of the French delegates was, however, adjourned, in order that the Electrotechnical Committees in the different countries might have an opportunity of further studying the subject. The Council also recommended that the Committee in each country should endeavour to arrange matters in such a way as to satisfy the needs of both the gas and electrical industries. Considerable progress has been made here; and the British Committee have now appointed a Sub-Committee, under the chairmanship of Dr. R. T. Glazebrook, F.R.S., to go fully into the details of the question. Dr. Glazebrook will be assisted by Dr. S. P. Thompson, F.R.S., British delegate to the Commission, Professor C. V. Boys, F.R.S., as official representative of the Gas Referees, and Mr. James W. Helps, M.Inst.C.E., officially nominated by the Institution of Gas Engineers. With the cordial co-operation of the gas industry thus obtained, it is hoped that the Sub-Committee may be in a position to report at no distant date, especially in view of the experiments lately carried out at the National Physical Laboratory, which point to the probability of an eminently satisfactory solution.

The Manchester Junior Gas Association will meet on Saturday to hear Mr. W. Buckley read a paper on the "Analysis of Spent Oxide." The subject to be discussed at a Coffee Meeting on the 16th inst. is "Town Gas in Competition for Power," which will be introduced by Mr. D. V. Hollingworth.

PROGRESS IN CONSTRUCTIONAL GAS ENGINEERING IN GERMANY.

The Berlin-Hanhalt Engineering Company's Plant Album.

(*Concluded from p.* 528.)

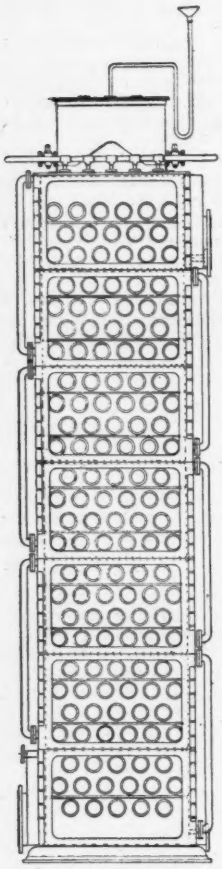


Fig. 11.—A "Reutter" Condenser.

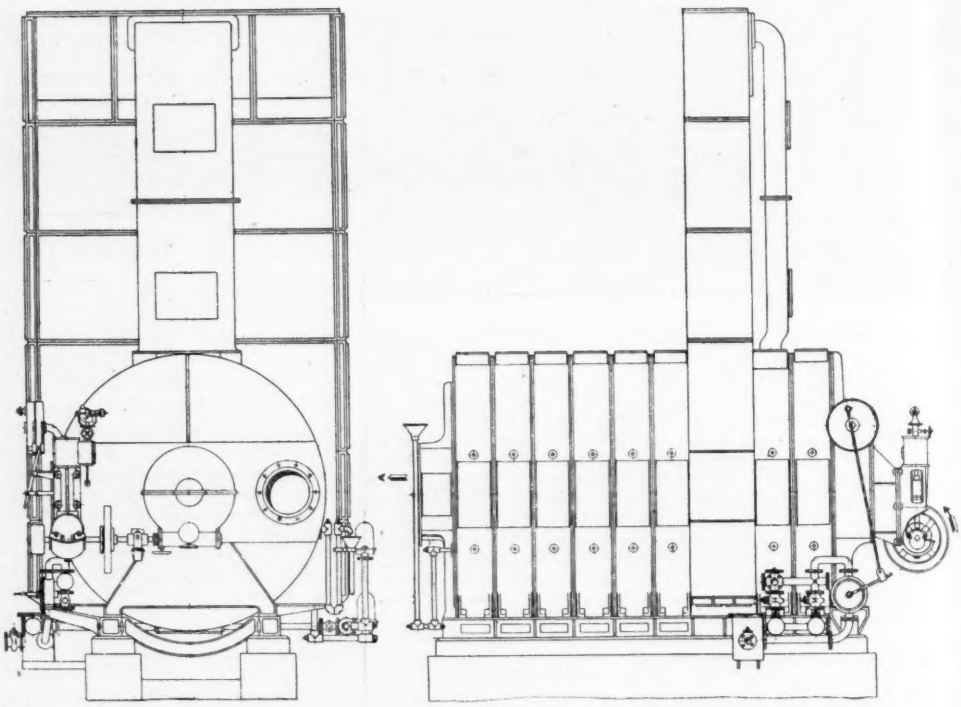


Fig. 12.—Condenser-Washer.

Condensing plant is described in the seventh section of the album. There are the vertical and horizontal tubular condensers differing but little from types which are common in this country. The Reutter condenser is, however, a pattern peculiar to Continental gas-works. It is shown in section, with a special water circulation, in fig. 11. The cold water enters at the base of the top section, rises in that, and passes by an overflow to the base of the next lower section. The gas enters at the base of the column, and rises through the several sections; so that at its outlet at the top of the column it is in contact with the coldest water.

Section eight refers to exhausting plant. It shows three-blade exhausters apparently very similar to those common in English gas-works, and a number of exhauster governors to which the same remark may be applied.

The ninth section deals with washing and scrubbing plant. The first item is the Pelouze and Audouin tar extractor, which has of late years been adopted in a good many gas-works in this country, though it is in much more general use on the Continent. The Drory tar separator which is next described, somewhat resembles the Pelouze and Audouin apparatus, but it subjects the gas before it enters the perforated bell to sprinkling with water or ammoniacal liquor. The introduction of this moisture to the gas is intended to lead to a more ready and thorough deposition of the tar by the separating bell. There are next described various grid and baffle-plate washers and tar extractors. Then follow descriptions of rotatory washer-scrubbers of the "Standard" type, and not differing greatly from those commonly in use in English gas-works. Washers of this pattern are made up expressly for the extraction of naphthalene by means of oil, and for the recovery of cyanogen by Dr. Bueb's washing process. A combination apparatus which is a speciality of the Berlin-Anhalt Engineering Company is the "Bamag" condenser-washer, of which a sectional view is shown in fig. 12. It comprises chambers of a rotatory washer-scrubber containing oil for the extraction of naphthalene, and next to them a vertical condenser of the Reutter pattern. From the condenser, the gas passes into other chambers of the rotatory washer-scrubber which are used for the extraction of ammonia. The advantages claimed for this apparatus are compactness, the simultaneous driving of the naphthalene and ammonia washers, and the reduction in number of connections and valves, since there is only one inlet valve and one outlet valve to the whole apparatus.

Section ten of the album refers to purifying plant. The ordinary type of purifying vessel, both with water seals and with dry seals, is described; and this is followed by a vertical type of which an example to be found at the Aschaffenburg Gas-Works is illustrated in fig. 13. The top and bottom plates of these purifiers are provided with manholes, fitted with self-sealing lids, through which the purifying material is introduced and discharged. It is arranged on special grids within the vessels. The gas enters at one side; and, by the disposition of the grids and plates, it is compelled to traverse the material in a lateral direction. It is claimed for this somewhat curious apparatus that, in addition to occupying less ground-space than the ordinary purifying vessel, it can be rapidly charged and emptied. Various

Fig. 13.—Vertical Purifiers at Aschaffenburg.

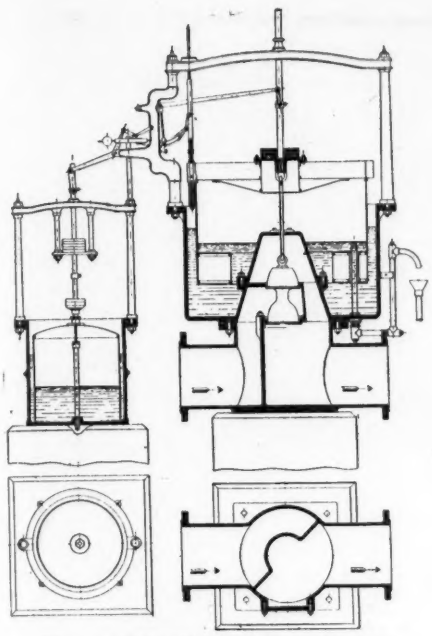


Fig. 14.—Water-Weighted Supply Governor.

types of cranes for raising the purifier lids are shown, as well as a number of different types of conveying plant for the handling of the purifying material.

The next section deals with station meters and governors. The construction of one (apparently a favourite) type of pressure regulator for the distributing system is shown in section in fig. 14. It is, as will be seen, weighted automatically by water, and is provided with a preliminary governor for taking up the greater fluctuations of pressure.

Section twelve contains illustrations and descriptions of gasholders erected by the firm. Among these may be mentioned a four-lift holder in course of construction at Charlottenburg Gas-Works, having a capacity of 160,000 cubic metres (about 5,650,000 cubic feet). This holder will stand in the open; but a number of large holders have been constructed, even in recent years, within gasholder houses—as, for instance, those at the Municipal gas-works at Vienna. The three-lift holder of 150,000 cubic metres (about 5,300,000 cubic feet) capacity at the Mariendorf Gas-Works at Berlin was constructed by the firm. This large holder stands in a masonry tank; but a number of other large holders have been constructed with iron tanks, as, for instance, the one at Charlottenburg already mentioned, and one of 50,000 cubic metres (about 1,760,000 cubic feet) capacity at the Zurich Gas-Works. The special tank construction designed by Professor Intze has been adopted in a number of instances, as, for example, at Görlitz. This holder is shown in fig. 15. It stands above a masonry tank of smaller dimensions, and thus shows how a holder may be replaced by one of greater capacity without enlargement of the ground area actually built upon. Another plan sometimes followed, where economy of ground space is a primary consideration, is the construction of an oil-storage tank within the gasholder tank. This is specially applicable, of course, to the relief holders of all carburetted water-gas installations. In

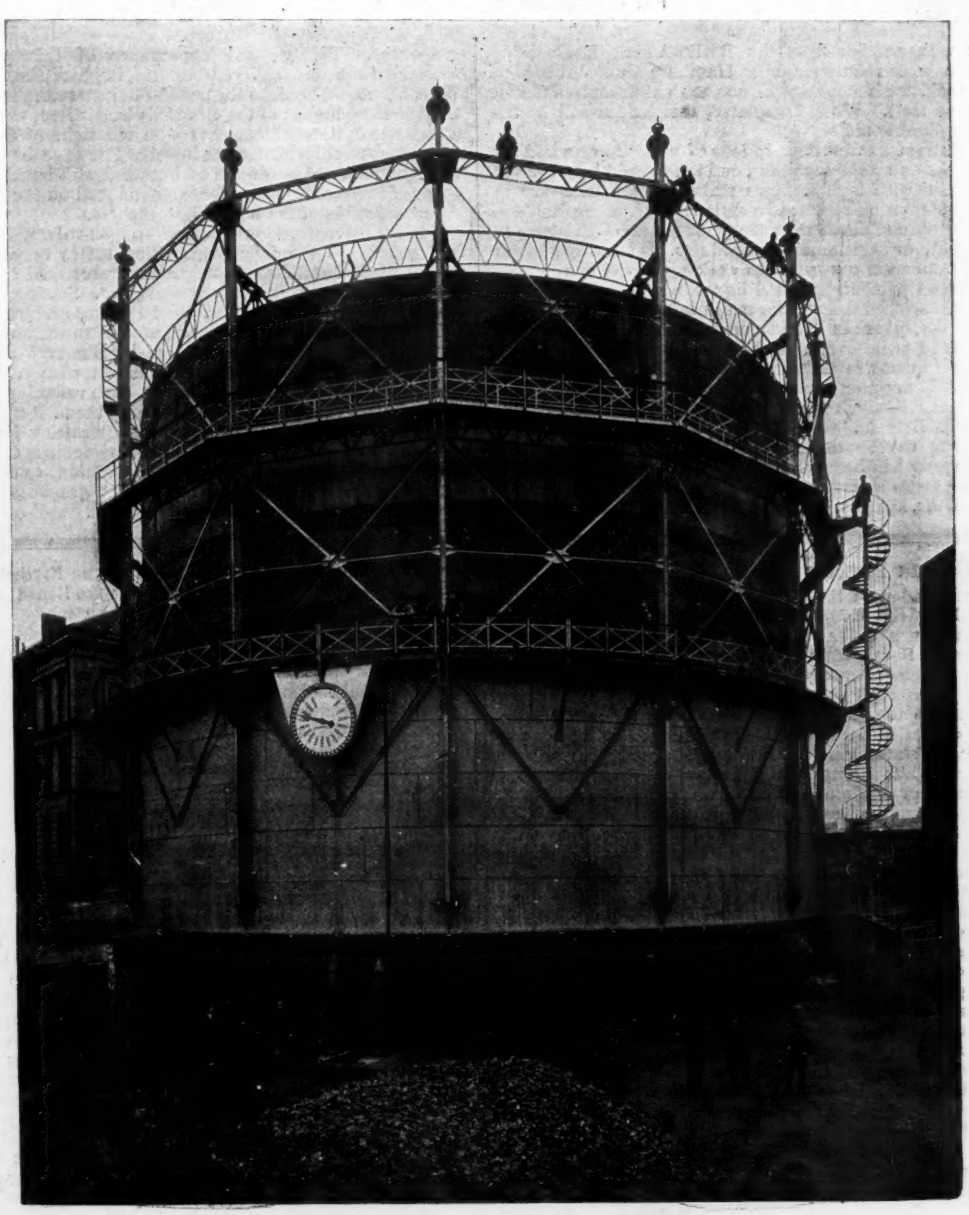


Fig. 15.—Gasholder, with Intze Tank, at Gorlitz.

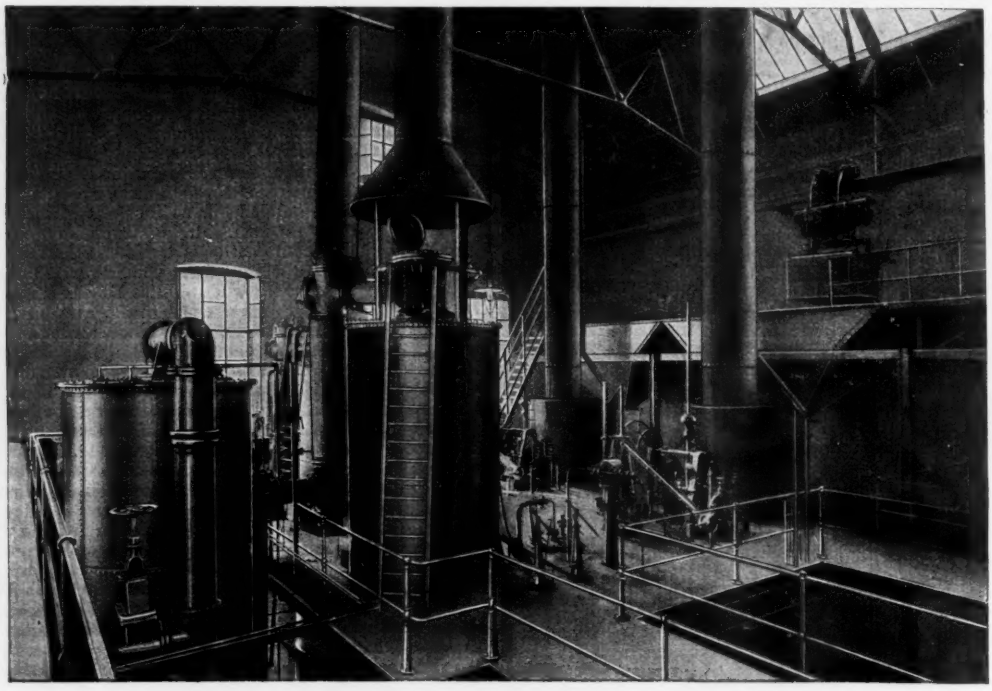


Fig. 16.—Carburetted Water-Gas Plant at Bale.

conjunction with another firm, the Berlin-Anhalt Engineering Company have under construction at Hamburg a four-lift holder, in an iron tank, for a capacity of 200,000 cubic metres (about 7,060,000 cubic feet). When completed, this holder will be the largest on the Continent.

The next section contains descriptions of water-towers and tar and liquor tanks and pumping plant, and is followed by a section dealing specially with high-pressure mains for the transport of gas from manufacturing stations to distant distributing holders. Section fifteen which follows refers to plant for the working up of liquor to sulphate or other ammonia products. It is a very general practice in Continental gas-works to work up liquor merely to a concentrated and partially purified liquor, which is disposed of as such, and either used directly for manurial purposes or worked up elsewhere to sulphate or liquor ammoniæ.

Section sixteen is interesting as showing the variety of water-gas plants now in use in Germany. Many installations for the manufacture of blue water gas according to the Dellwik-Fleischer process are shown—among others the plant at the gas-works at Nuremberg, Breslau, and Görlitz. Carburetted water-gas plant according to the designs of the German Water Gas Lighting Company has been erected at a number of gas-works, including two of the manufacturing stations of the Municipality of Berlin, and the Darmstadt, Bâle, Trieste, and Charlottenburg gas-works. The general appearance of this plant may be seen from the annexed view of the stage of the installation at Bâle, fig. 16. The coke for use in the generators is brought into the house by means of the elevated electric line, which is entirely automatic in its working, shown on the right of the illustration. A number of other water-gas installations have been erected for the production of water-gas carburetted with benzol, and special types of carburettors have been introduced on the Continent for the evaporation of the benzol into the gas.

Section seventeen is devoted to gas-valves, both dry and hydraulic; and the following section refers to pressure-gauges and analytical and photometrical apparatus. At the close, a few typical experimental gas-works are shown. Section nineteen deals with pipes, unions, syphons, pipe-cutters, and gas bags. The twentieth and last section contains illustrations of the ordinary retort-house tools and of the special "Bamag" distance-lighter for street-lamps. The album concludes with a list of about twenty catalogues issued by the firm, each referring to a different class of gas plant or apparatus made by them.

In bringing this review of the more interesting features of the album issued by the Berlin-Anhalt Engineering Company to a close, we may fitly express our congratulations to the firm on the wide extent of their activities among the gas-works of the Continent and more remote parts of the world.

The German Emperor and Divining for Water.

The second session of the German Agricultural Association, was attended by the Emperor, for the purpose of hearing a lecture by Baron von Uslar on results of his labours in locating water in German South-West Africa by means of the divining-rod. It may be remembered that His Majesty, having complete confidence in the Baron's powers, sent him to Africa a few years ago to indicate to the authorities where they could find water; and he gave a detailed account of his operations. In the course of his lecture, he stated that up till September last year he discovered 800 sources of water in the colony. The authorities decided to bore 148 of them, and water was found in 117 places, while it was not found in the remaining 31 places. Expressed in percentages, he divined correctly to the extent of 79 per cent. He exhibited the rod with which he had achieved these results, and frankly acknowledged that he could not explain how it was done; but he thought it was the duty of scientists to investigate cause and effect instead of disputing facts. He added that it seemed that he possessed a Divine gift which was bestowed on certain human beings in varying degrees; and he felt it was his duty to use it for the welfare of the Fatherland. The lecture was received with loud applause; and subsequently Herr Dernburg, the Imperial Secretary of State for the Colonies, expressed the thanks of the Government to Baron von Uslar for undertaking, notwithstanding his advanced age, investigations which had been productive of many useful results. In view of the severe criticism to which the Baron's work has been subjected in scientific circles, this pronouncement by the representative of the Government will probably lead to considerable controversy.

Mr. Thomas Parker, M.Inst.C.E., has been elected a Director of the British Coalite Company.

Underground Waters of Bedfordshire and Northamptonshire.—We have received from the Secretary to the Board of Agriculture and Fisheries (Sir T. H. Elliott, K.C.B.) a memoir of the Geological survey on the water supply of Bedfordshire and Northamptonshire. It deals with the supply of these counties from underground sources, and contains a general description of the geological formations with reference to their water-bearing capacities. Sections are devoted to well sinkings and borings, and to the analyses of waters, with notes on mineral springs. A full historical account of the water supply of the town of Northampton is given. The joint authors are Mr. Horace B. Woodward and Mr. Beeby Thompson. The memoir is accompanied by rainfall maps of the two counties, with explanatory reports and statistics by Dr. Hugh Robert Mill. Copies may be obtained from the Ordnance Survey Office, Southampton, at 4s. 6d.

"Sulphite Pitch" as a Briquette Binder.—According to a recent United States Consular report, the disadvantage attaching to coal-tar pitch as an agglomerant in briquette making are absent from the binding agent known as "sulphite pitch." The material is obtained in the process of manufacturing sulphite cellulose. In the ordinary briquette of bituminous coal, from 7 to 10 per cent. of coal tar is used to give it the proper hardness; but with the use of sulphite pitch it is said that the same results can be obtained by the use of 5 per cent. There are qualities of coal and ore that can easily be briquetted with from 2 to 3 per cent. of the material, which burns at a high temperature without smoke or odour, and does not soften under heat. It can be ground to any consistency, or be produced directly in any form of powder; and it can be had in every country where there are cellulose mills. Practical trials of both blast and cupola furnaces have shown that the briquettes do not fall to pieces even under the highest temperature, but burn while gradually shrinking.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Annual Meeting in Manchester.

The Thirty-Ninth Annual Meeting of the Institution was held on Saturday in Manchester, and was largely attended. In the early part of the day, members assembled by the Old Infirmary, in Piccadilly, and subsequently proceeded by special tram cars to the Newton Heath works of Messrs. R. & J. Dempster, where they had an opportunity of seeing Feld's washer, a description of which was given in the "JOURNAL" for July 21 and 28 last year, pp. 161 and 228. They afterwards paid a visit to the Bradford Road station of the Manchester Corporation Gas Department, where an inspection was made of the gasholder tank now in course of construction there. A full description of the tank, by Mr. J. G. Newbigging, the Chief Gas Engineer of the Manchester Corporation, will be found on p. 619.

At the close of the inspections, the members assembled at the Grand Hotel, where they partook of luncheon.

The Business Meeting.

The business meeting was held in the large hall in the hotel. Mr. T. DUXBURY (Oldham), the retiring President, occupied the chair, and was supported by Mr. J. W. Morrison (Sheffield), the President-Elect, and Mr. W. Whatmough (Heywood), the Hon. Secretary. Among the letters of apology received from members unable to be present was one from Mr. Thomas Newbigging, who stated that he was engaged in London with the Society of British Gas Industries.

COMMITTEE'S REPORT.

The Committee opened their report by stating that the interest of the members in the affairs and progress of the Institution had been maintained during the year, and the proceedings enriched by valuable contributions which had led to good discussions. In addition, a full description had been given of the Frizinghall Chemical Works of the Bradford Corporation, by Mr. Charles Wood, and of the Hollinwood and Higginshaw Gas-Works of the Oldham Corporation, by the President, Mr. T. Duxbury. The alteration of the rules with reference to exchange of representation by the Manchester and Yorkshire Junior Associations and the Institution had come into operation; and there was every reason to believe that the change would be beneficial to the three bodies. The Commercial Sections had continued their usefulness, and would improve as the members realized more the importance of this section of the Institution's work. Having reviewed the proceedings of the year, the Committee referred to the reduction of the number of meetings to three and to the nomination of Mr. E. Allen, of Liverpool, to represent the Institution on the Committee appointed to consider the question of the "Standardization of Refractory Materials." The Committee decided that the balance of £23 6s. 10d. remaining from the Manchester Gas Exhibition should be divided between the Benevolent Fund of the Institution of Gas Engineers and the Society of British Gas Industries. At the date of the report, there were 155 members upon the roll; being an increase of two. The Committee referred to the deaths of Mr. George Smedley, of Buxton, and of Sir George Livesey. In regard to the latter, they placed on record their "appreciation of the services he rendered to the industry he loved so well," and mentioned their decision, subject to the approval of the members, to contribute 25 guineas to the Memorial Fund. They closed their report with a further appeal on behalf of the Benevolent Fund of the Institution of Gas Engineers.

The PRESIDENT, in moving the adoption of the report, said he desired to emphasize several points contained in it. As to the selection of Mr. Allen to represent the Institution on the Committee formed to consider the question of the standardization of refractory materials, he said there seemed every prospect of the matter being proceeded with, for the Council had voted a sum of £50 towards the cost of investigating the subject. On this matter they were, he believed, practically unanimous. It was a very important question, and he was sure a great deal of knowledge would be obtained regarding it by its investigation. Referring to the death of Mr. George Smedley, at the advanced age of 89, he said it seemed to show that the gas profession was not the unhealthy one some people would make it out to be. Passing on to deal with the memorial determined upon to the late Sir George Livesey, he informed the meeting that the Council had decided to forward a subscription of 25 guineas to the fund; adding that they hoped individual members would also contribute to so worthy an object —the endowment of a Professorship in Gas Engineering and Fuel at Leeds University. Coming to the appeal made for increased support to the Benevolent Fund of the Gas Institution, the President said it was a matter in which he was deeply interested. As their representative on the Committee of Management, he had made it his business to find out how the fund was distributed; and he would say this, that if members of the Manchester District Institution knew as much as he did, they would all gladly subscribe to the fund. Since their last meeting at Oldham, they had had two cases in which grants had been made. One was that of an old and respected retired gas engineer, aged 88 or 89, who had just sufficient money to keep him going; but, in consequence of doctor's bills and other things, he had run into debt to the extent of about £25. This was a case of great need; and help had been given from the Benevolent Fund. The other was an almost similar case; and, as one who had devoted a good deal of time to the subject, he (Mr. Duxbury) desired to emphasize the appeal made for increased financial support from gas engineers. At the same time, on behalf of the Council, he had to thank those who had so heartily responded to the appeal previously made for the fund. It had resulted, he believed, in about 27 new subscribers; bringing the total up to 60 or 61, which was certainly a great improvement. Still, it was felt that they should have at least 100 subscribers from the Manchester Institution to this really admirable fund.

Mr. S. GLOVER (St. Helens) seconded the motion; and it was carried unanimously.

THE ANNUAL ACCOUNTS.

The statement of accounts for the year ended February, 1909, showed that there was a balance in hand of £59 18s. 5d., compared with £37 14s. 5d. at the close of the preceding year.

Mr. G. B. SMEDLEY (Swadlincote) moved that the accounts be approved.

Mr. H. TOWNSEND (Wakefield) seconded the motion.

Mr. S. GLOVER, while supporting the motion, said he was sorry to see so large a balance in hand; being of opinion that it was not needed and could have been applied in some useful way.

The PRESIDENT said this matter had not been lost sight of by the Council; and he pointed out that from the balance 25 guineas had been voted to the Livesey Memorial Fund.

REPORTS OF COMMERCIAL SECTIONS.

The reports of the two Commercial Sections having been taken as read,

The PRESIDENT observed that these Sections were doing a great work for the gas industry.

Mr. S. E. HALLIWELL (Littleborough), on behalf of his Section, said that, by their work, the Sections had fully justified their existence; and he expressed the hope that they would have a larger membership than they had.

Mr. F. H. PICKLES (Kildwick) speaking for the Yorkshire Section, expressed regret that they had lost the services of their Secretary (Mr. Brearley), whose enthusiasm and energy in the work were fully recognized by all. He agreed with the previous speaker as to the Sections having fully justified their existence; adding that he should like to see the managers of a good many more gas-works, who were not as yet on the list of membership, joining them, as it would benefit them and the Section by having greater unity.

The PRESIDENT said they were much indebted to the Secretaries of the two Sections for having placed before them such good reports.

REPRESENTATIVE ON THE PARENT INSTITUTION.

On the motion of the PRESIDENT, seconded by Mr. R. WATSON (Doncaster), Mr. W. Whatmough, the Hon. Secretary, was again elected to represent the Institution on the Council of the Institution of Gas Engineers for the ensuing year.

ALTERATION OF DATE OF AUTUMN MEETING.

Mr. S. GLOVER moved that the recommendation of the Committee that the rules be altered so as to allow of the autumn meeting being held in October, instead of November as at present, be approved. He said the Committee considered that with the abolition of the August meeting, through lack of support, the interval from May to November was too long. Further, it was felt that the holding of a quarterly meeting on the last Saturday in November was a mistake in several ways; it having been suggested, for instance, that many of the members would be better at home attending to their own business. Much of the opposition offered to the proposed change had been removed; and the Committee now recommended that the quarterly meeting be held on the last Saturday in October instead of November.

Mr. T. B. BALL (Rochdale) seconded the motion.

Mr. R. SURTEES (Fenton) did not think adequate reasons had been advanced for the proposed alteration; the only one given for the change being that some thought they, as gas engineers, would be better engaged at home than in attending a meeting of the Institution in the last week of November. He had no doubt this was the opinion of some of their Committees; but, to his mind, it was not a sufficient reason for changing the date of the meeting. He therefore moved, as an amendment, that the dates of the meetings be as heretofore.

Mr. H. BARKER (Buxton) seconded the amendment.

Mr. S. S. MELLOR (Northwich) questioned their being in order in altering the rules without notice.

The HON. SECRETARY, however, showed that, according to the rules, they were quite right deciding the question at the present meeting.

On a vote being taken, the amendment was lost, and the recommendation adopted.

THE LIVESEY MEMORIAL.

On the motion of the PRESIDENT, seconded by Mr. MELLOR, the grant of 25 guineas made by the Committee to the Livesey Memorial Fund was confirmed.

TRIBUTE TO THE NEW PRESIDENT.

The PRESIDENT said, before introducing his successor to the meeting, he wished to say how grateful he felt personally for the splendid support accorded to him during his term of office by the Committee and all the members of the Institution, as this had certainly made his duties very much lighter than they otherwise would have been. It had been a real pleasure to him to serve as President of so great and important an organization as the Manchester District Institution of Gas Engineers, which was regarded as the finest in the gas engineering world. He sincerely thanked the members for the honour they did him in electing him to this position, and for the loyal support since accorded to him. He was quite certain he could bespeak for the new President the same measure of support. Mr. Morrison was a gentleman of wide experience in the gas world, and had charge of large and important works. They knew that those under his management were carried on in a businesslike way; and in placing him at the head of the Institution, they not only honoured him, but were, as an Institution, highly honoured in having him as President. He (Mr. Duxbury) did not think any words of his were required to introduce Mr. Morrison. The members all knew his work, and also knew that he was qualified to fill the position he was about to occupy. He (Mr. Duxbury) therefore had the greatest pleasure in asking Mr. Morrison to occupy the chair for the ensuing year.

Mr. Duxbury then vacated the chair, and it was taken by Mr. Morrison amid continued applause.

THANKS TO THE PAST-PRESIDENT.

The PRESIDENT expressed his thanks to the members for the honour they had done him, and said it would be his aim to do the best he could for the Institution during his year of office. He moved that their best thanks be tendered to Mr. Duxbury for his services during the year. Mr. Duxbury had had a most successful term of office, and had spared neither time nor trouble in carrying out the duties of President.

Mr. J. H. CROWTHER (Wallasey) seconded the motion, which was carried with acclamation.

Mr. DUXBURY thanked the members heartily for their vote, which he said was really not necessary, considering the way in which they had rallied round him during his presidency.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty on addressing you from the chair is to tender you my heartiest thanks for the honour you have conferred upon me in electing me your President for the current year, and to ask the members for the support and co-operation that have been so generously accorded my predecessors in office. I can assure you that I will do my utmost to further the welfare of our Institution; and I hope we shall have a useful and prosperous year. I can hardly claim your attention on the ground of anything new, but I will endeavour to put before you my views on a few points which I trust will interest you. The preparation of a Presidential Address is a task which does not ordinarily fall to a man many times in his life. Therefore, it is to be esteemed as both an opportunity and a challenge—as an occasion for reciting the articles of one's professional belief, and also for justifying one's practice. It has been said by a wise man of old that "In the multitude of counsellors is wisdom;" and it is equally true that in the variety of experience there is instruction.

Before dealing with gas matters, I should like to congratulate our Association on its vitality and continued prosperous condition. We have now 157 members on our books; being a net gain of two during the year.

The Commercial Section is still doing good work, and is extending its circle of usefulness in many directions. That this branch of our profession is also a necessity is evidenced by our colleagues, the Southern District Association, who, so recently as last autumn, started a Commercial Section on similar lines to that inaugurated by our Institution.

THE SIR GEORGE LIVESEY MEMORIAL.

I am sure I shall be pardoned for mentioning particularly the loss that the whole gas industry has sustained by the death of Sir George Livesey, a man who was recognized as the Field Marshal of our forces, standing as he did head and shoulders above the rest of us. Who is there who would have persevered like him to get the absurd sulphur clauses repealed, and who else could have persuaded Parliament to agree to the lowering of the illuminating power standard, to meet the modern method of burning gas, except Sir George Livesey? He, by his conspicuous sincerity and sound judgment, won the confidence of Parliament; and a very large number of British gas companies, corporations, and consumers are now reaping what he sowed, and no doubt the remainder will also participate when opportunity arises. I sincerely hope the recommendations of the Institution of Gas Engineers to commemorate him, by endowing a Chair at the Leeds University in his name, will meet with the support it so richly deserves. I strongly appeal to our members to bring this matter before their Directors or Committees, and trust that substantial contributions may be obtained. I am sorry to see that the subscription list is almost entirely made up of the donations of companies and private individuals—only eight corporations appear so far on the list. Surely there must be means by which corporations can grant donations to so worthy an object, seeing that they have benefited equally with gas companies in the result of Sir George's labours, and will also participate in the fruits of research work done. Looked at from a business point of view, the money required is really for paying a specialist to keep gas manufacturers, one and all, in advance of the times. I hope the example set by our Institution and our Commercial Section in subscribing to the fund will be followed by the Institution of Gas Engineers and all District Associations. If the contributions towards this endowment were only proportionate to the fruits of Sir George's far-sighted labours for the benefit of gas manufacturers and consumers alike, they would easily provide not merely for one chair, but for a whole college. To help forward the movement, my Directors have voted a sum of £200 to the fund, at which I am highly gratified.

GAS CONSUMPTION.

Very few gas undertakings will, I think, be able to show much increase in their gas output for the year 1908, owing, firstly, to the exceptionally mild autumn, and, secondly, to the bad state of trade generally. But this circumstance I do not think need cause any alarm, as the previous years have, in most cases, shown satisfactory increases. In Sheffield, we had increases of 3·19 per cent. in 1905, 6·38 per cent. in 1906, 8·70 per cent. in 1907, and 2·60 per cent. in 1908 (the latter increase was wholly in the first six months of the year); being a net increase in the four years of 22½ per cent. This is a result of which I am naturally very proud, and which I attribute chiefly to being able to sell gas at a low price.

CHEAP GAS, AND HOW IT IS DONE.

A few years ago, one of our most honoured members said to me, when I told him that in Sheffield our average selling price of gas was then just over 1s. 3d. per 1000 cubic feet, "Oh! you will be giving it away with a 'Pound of Tea' next!" Well, we are not doing that; but our aim has always been to sell gas at as low a price as possible. At the present time we are selling gas for lighting and other purposes at prices varying from 1s. to 1s. 4d. per 1000 cubic feet, and for power and public lighting at 1s. What does this mean to the city? It encourages manufacturers, who employ labour, pay rates and taxes, and who can get an "ever ready" and a cheaper power from coal gas than can be obtained from steam, electricity, or suction gas; and it also helps to keep a purer atmosphere—even for Sheffield and its environs—than could be otherwise ensured.

Perhaps it may be news to many members to know that we have no slot meters. But when I point out that we have 30,069 two-light and 42,200 three-light meters, out of a total of 93,676 meters and a population of 460,000, it will be seen that there can be only a very few houses that are not supplied with gas. Moreover, we charge one and the same price for gas over the whole area of our supply, which extends upwards of 8 miles from the works. I am often asked "How is it you are able to sell gas at such a low price?" Well, the answer is partly to be found in the facts that:

1.—Our capital account is very low.

2.—We have no "dead" or unproductive capital charges, every asset being maintained on the active list.

3.—The Company from its amalgamation having been fortunate in possessing level-headed business men as chairmen and managers, who laid a good foundation. I would here specially refer to the great advantage we so long enjoyed in the chairmanship of Sir Frederick T. Mappin, to whose administrative ability and keen judgment the present position of the Company is largely due.

4.—The buying and selling of all material are in the hands of the Chairman and Managing-Director.

5.—Being a proprietary Company, "slow-timing" by the employees is not in evidence; while the rate of wages paid for carbonizing compares favourably with other works.

6.—We have no carburetted water gas, with all its so-called collateral advantages!

7.—We, like many other large towns in the central counties of England, are situated within a short distance of the coal-fields; and we try to purchase for value coal as near home as possible, and do not ordinarily pay very high rates for freightage.

8.—Being a hardware city, we are able to dispose of most of our coke locally.

9.—My Company have always made it a rule to carry out their extensions of mains and plant when trade was bad, so that they could get the benefit of low prices. Whereas many committees and directors will not spend money to meet prospective demands before it is absolutely necessary, which generally happens when trade is booming. Then they have to pay enhanced prices for labour and materials. I have a good instance of this in the 8-million cubic feet holder and tank built in 1904-5, when we were able to place the contracts at "rock-bottom" prices; the total cost being £54,400, or £6800 per million feet of storage. Had this work been deferred till two years later, it would have cost my Company at least another £8000, according to the average extra value of materials and labour at that date.

TO PUSH THE SALE OF GAS.

We maintain incandescent burners at 3d. each per month, providing new mantels, chimneys, and rods when necessary, cleaning all inside fittings and the outside of lamp globes, and attending to the burners every fortnight, although in some special cases we pay visits weekly. I think I am right in stating that my Company were the pioneers of this class of business. At the present time a staff of one foreman and 33 men are engaged solely on this work, and they have 29,354 burners under their charge. We maintain from one burner upwards. We do this work at practically cost price; but this is only a secondary consideration when we know that we have thoroughly satisfied so many consumers, who, in many cases, would not be bothered with keeping their incandescent fittings in good working order. It will perhaps surprise members, as it did me, to know that our experience with the maintenance of inverted burners is that we use nearly as many mantles per burner as on the upright incandescent burner.

We have also a staff of twenty fitters, whose duty it is to clean, free of charge, all gas-fires and the burners and fittings on stoves three times annually. This, I think, goes a long way to popularize gas-fires for bed and living rooms; for we well know the liability of consumers abandoning gas-fires if they are dirty and out of order, or whistle badly. In addition to the above, we have a practical gas-engine fitter, who visits every gas-engine once per year, and who can advise consumers if their engine is not working satisfactorily, attend to defective gas-bags, and show the attendant how to do any small repairs that are necessary. There are 1036 gas-engines in Sheffield, of from ½ H.P. to 220 H.P., and only one suction-gas plant.

Two canvassers are specially told off to get orders for incandescent burners and lamps, and give estimates for improvement in lighting shops, &c. We let out stoves on simple hire or hire-purchase at cost price, but do not supply any free fittings, cookers, &c., believing in the maxim that "if a thing is worth having, it is worth paying for." We retain a greater portion of the gas-fitting business of the city in our own hands, thereby insuring good material and workmanship and an ample supply of gas to the consumer.

A series of lectures and demonstrations are given during the autumn evenings by our Gas-Fittings Superintendent. All the fitters in connection with the Distributing Departments are expected to attend, and are paid for the time. Great pains are taken to explain to them practical gas-fitting, the bunsen burner, incandescent vertical and inverted burners, ventilation of gas fires and stoves, and the construction and use of all modern gas-burning apparatus.

During the last few years, we have fitted upwards of 110 gas-furnaces to work with air-blast, for heating metals, including the welding of boiler-tubes from 3 feet diameter, and the making of horse-shoes, files, chisels, drills, shovels, springs, cutlery, &c., &c.

COAL TRAFFIC AND COAL-TAX.

Gas-works often find that the railway companies neglect their coal traffic if the freight is low, when they can get a train of coal through for shipment abroad. This, I think, is a matter the Board of Trade and Chamber of Commerce ought to take up, for the railway companies, being statutory concerns like gas undertakings, should not be allowed to favour one class of customer at the expense of another. In Sheffield, we have had dozens of trucks of coal shut up in a company's siding for days together, although at the same time train loads were passing our works from the same collieries on their way to shipping ports. I am strongly of opinion that it was a great mistake to take off the coal-tax; and I hope the day is not far distant when it will be put on again, at even a higher rate. Coal, being a national asset, the State ought to benefit financially by all the coal that is exported, especially when it goes largely to produce the finished material which is sold in competition against our taxed and rated industries.

MINES (EIGHT HOURS) BILL.

Labour legislation is doubtless occasionally necessary; but when it comes to limiting the hours an able-bodied man shall work per day, without compelling him to work so many days per week, it becomes a freak, puts a very heavy burden on all classes of manufactured goods, and seriously handicaps the manufacturer in the keen fight for trade at home and abroad. Last autumn, plenty of pits were restricting their output by not working on Wednesdays and Saturdays, thereby bolstering-up prices instead of favouring dealings.

COKE.

During last season, owing to the mild weather and slackness of trade at home and abroad, large stocks of coke have accumulated, and the selling price has had to be reduced to a far greater extent than the reduction in the price paid for coal. I think, however, much more coke might be sold to small customers if all gas undertakings would give credit for coke to their gas consumers. We always do this; and it is much appreciated. And although we make some bad debts, yet the amount obtained from this class of custom pays far better than sending abroad at low prices, or out of town in competition with other gas-works. Any gas consumer who is not in arrears with his gas account can order half-a-ton and upwards of coke and pay for it with his gas bill. I learn that in London and elsewhere a practice has arisen of selling broken coke for domestic consumption in small quantities. Vans go round with parcels of coke in paper bags, containing 28 lbs., for 4d. delivered. This is found a great convenience to dwellers in flats and town houses with small cellar accommodation; and I think this example might be followed with advantage. A new use for fine coke dust has recently been found. When mixed with screened spent lime in equal proportions, this has proved a very effective dressing for the turf of golf courses—especially where the land is at all heavy. We get 1s. 7d. per ton for this mixture at the works.

RETORTS.

I am a strong advocate of retorts built up of bricks and tiles in preference to the moulded ones, for many reasons, some of which are that they can be repaired so much easier, owing to the joints being all at right angles to each other; that the bottom and sides of the retort which are subject to the greatest friction, and are kept cooler by the coal, can be made of a material better suited to stand wear and tear, using a higher refractory—although softer—material in the crown of the retort, which is not subject to friction, but which it is most important should retain its shape. It is no uncommon thing for us to have settings at work that have been in actual use over 2000 working days—some have run as many as 3300 days; and I think you may take it from me that we should not have repaired them from time to time if it had not paid us to do so. We run the majority of our settings for eighteen months without letting them down. I am certain that loss of gas from a built retort is less after the first season's working than with a moulded retort, owing to the contraction taking place at the joints, which are mostly sealed in the cross walls, instead of forming new irregular cracks, which in whole retorts usually occur between the cross walls.

With the introduction of retort discharging machines, the tendency of present-day carbonization is to considerably increase the weight and duration of the charges; and I see no reason why chamber-ovens, such as are used in up-to-date coke plant, should not be brought into use in large gas-works. I think it is in this direction that improvements in carbonization may be looked for—in fact, the Koppers Coke Oven Company, have within the last five months started an installation at the Bochum Gas-Works, in Westphalia, as well as at the Vienna City Gas-Works. Charges of eight tons are burnt off in each oven in 24 hours; and a yield of between 11,500 and 12,500 cubic feet per ton is obtained. The coke made from the chamber-ovens is much denser than that from ordinary retorts, owing to the depth of the charge of coal, and should command a higher price.

Early this month I inspected a large installation of coke-ovens at the Manvers Main Colliery, near Rotherham, and was very favourably impressed with the uniform heating of the ovens, and the ease by which the heats could be controlled. I also noticed that the gas, after leaving the tar-extractor, was passed through a superheater, and then direct into an acid saturator, to convert the ammonia into sulphate, instead of through ordinary washers and scrubbers. By this means Messrs. Koppers, the patentees, claim that there is an increase of 12½ per cent. in the yield of sulphate of ammonia per ton of coal, that the sulphate made contains less free acid, that the lead of the saturator is subject to less wear and tear, and that the quality of the gas is not reduced by passing it through the acid bath. Certainly the sulphate of ammonia I saw made was a splendid, white, coarse crystal.

Hitherto it has not been found practicable to pass gas in a cold state containing ammonia into sulphuric acid, as the water vapours would be absorbed by the acid, diluting it, and rendering the bath ineffective. Messrs. Koppers therefore applied Dalton's law of the vapour tension of gases, and condensed the gas to between 60° and 70° Fahr., to remove the tar and water vapours. They then superheated it to a temperature of about 150° Fahr.; and as the gas does not then come in contact with any water, it cannot attain the degree of saturation corresponding to the increased temperature, but can be passed direct into a saturator, where it takes up moisture to bring it to saturation point, and the ammonia is neutralized. No trace whatever is found of acid being carried forward with the gas from the saturator. This arrangement only deals with the ammonia that would be extracted from the gas by washers and scrubbers. The liquor made in the hydraulic mains and the condensers would still have to be dealt with in ordinary stills. I would point out, however, that if this system were to be adopted in gas-works, we should lose the work now done by the ammonia in the washers and scrubbers in reducing the carbonic acid and sulphuretted hydrogen, which in some cases represents 25 to 33 per cent. of the total impurities passing into the purifiers. But against this, we should not require such large liquor wells, any washers or scrubbers, could reduce the size of our stills, and there would be less liquor to be pumped, and less steam required.

PURIFIERS.

Now that purifiers, by the adoption of hurdle and similar forms of grids, are being filled full of oxide, more care must be taken to see that the material does not get too consolidated before the purifier is changed, for undoubtedly a very much greater outward pressure is put upon the sides of the boxes than hitherto. I had an instance of this at one of our works, and only found it out by observing that the water in the lute was falling, and on seeking the cause, found that three of the side plates had cracked vertically, due to the material in the box expanding. This might have caused a blow, and again shows the advantage of our old colleague's (Mr. Green's) invention of the luteless purifier, which is stiffened at the top of the sides by the strip on which the cover

rests. With regard to the question of whether the current of gas should be admitted at the top or at the bottom of the box, my experience of both is against the former method, which gives more back-pressure, owing to its consolidating the material, and causes more condensed water to be retained in the oxide. The first tray in the finishing box, being the one through which the hot gas from the third box (usually the most active) passes, condenses the most water; and if this is on the top of the box, the water drops from this tray downwards, and so consolidates the lower tiers, diminishing the work done by the oxide. Whereas, if the inlet is at the bottom, the moisture condenses in the bottom of the box, and drips therein from the first tier; thus allowing the upper trays to be in a drier and better working condition. From tests made, I found just double the water in the bottom of the purifier where gas was admitted at the bottom, compared with others where it was admitted at the top. Neither do I believe in the "working backwards" plan of changing the boxes; our experience being that it shortened the life of the clean boxes, and consequently gave very little warning before the whole set became dirty.

CARPENTER'S NO. 2 "LONDON" ARGAND BURNER.

It is to be hoped that the Board of Trade at an early date will recommend Parliament to make the Carpenter No. 2 "London" argand burner the universal standard burner for Great Britain; for it is very misleading, when comparing results, to find the candle power given for two works, using different standard burners, at (say) 16, whereas one works would actually be supplying 18 and the other 16 candles if the gas was tested by the same burner. When it is a question of choice of systems, the No. 2 "London" argand stands alone on its merits, which have caused its adoption by the London Gas Referees and by many gas undertakings who have had the opportunity of doing so.

METER-RENTS.

My Company have always charged their consumers rent for the use of meters; believing it a better and more equitable policy to do so, rather than add an equivalent cost to the selling price of gas. That this is the correct method is, I think, proved by more than one large Company reinstating the charge for meter-rents. This is more necessary than hitherto, with so many consumers having adopted electric light keeping their original meters as a standby, yet idle to a certain extent.

DAYLIGHT SAVING BILL.

I extracted some figures by taking the difference in the gas consumption from 10 p.m. to 11 p.m., and the consumption between 2 a.m. and 3 a.m., and as a check, the output between 4 a.m. and 5 a.m. daily, for the six months, to see what would be the probable loss to my Company if the suggestion to put the hands of the clock back one hour during the six summer months became legal. I found that our gas consumption would probably be reduced by some 80 million cubic feet, or about 2½ per cent. on our output, which would mean an annual decrease in our revenue of about £4500. But I do not think this question should be looked at from a mercenary point of view; and I, for one, should be pleased to see the Bill become law.

EMPLOYERS' LIABILITY.

Instead of insuring our workmen against accidents with an insurance company, in 1898 we started a fund of our own, setting aside 6s. 8d. per cent. on the wages paid. Under the old Act, we found this sufficient to cover all claims. With the advent of the present Act, we thought it policy to increase our premium to 8s. per cent.; but at present it is rather early to say whether the amount we are putting by will cover all liabilities. I need hardly point out to you the absurdity of the 1907 Act, and how it sets a premium for men to spin out the time they need be absent from work for trivial accidents. Take the case of a labourer getting 24s. per week, if this man was incapacitated for one week, and was in a sick club from which he was entitled to 10s. per week, by malingering for a second week he would be 10s. more in pocket at the end of the second week than if he had gone to work at full wages after the first week's absence, thus:

	£	s.	d.
One genuine week's illness, club allowance . . .	0	10	0
Resume work at commencement of second week, and draw full week's wage	1	4	0
Total received during the two weeks	1	14	0
By being genuinely ill for one week, and malingering the second week, he gets club pay two weeks, at 10s.	1	0	0
Two weeks' half pay, wages at 24s. per week. . .	1	4	0
	2	4	0
Net gain to the man	0	10	0

This sort of thing is proving ruination to the various sick societies, and is rapidly depleting their funds. A remarkable instance in point was given by Mr. Blossom, the Actuary, at the half-yearly meeting of the Independent Order of Druids in Sheffield in November last, who stated that "In the present state of affairs, they had no right to ask others to join their Society; for their valuation showed a deficiency of over £558,000, and that their sick pay had risen by over £10,000 during the last six months, compared with the corresponding period of 1907." Another delegate stated, "The Workmen's Compensation Act had a lot to answer for. It had made some of their members what they ought never to have been, and that when a man was drawing his compensation, his club money, and sick pay, he was unfortunately very loath to start work again." I feel certain this Act will have to be amended; for it is undoubtedly a cause of friction between employer and employed. I often feel sorry for men applying for work, who are getting on in years, and who possibly are not able to do a full day's work, but are willing to do their best at their trades. These men have to be refused employment because they are getting old, and are not so nimble as a younger man. Trades Unions compel men to be paid full wages or not employed; hence many old men who could earn a good living go to swell the ranks of the unemployed. Union officials do not want these men, but the younger member, who, of course, is less liable to illness, and is more easily led by the paid agitator.

TERRITORIAL FORCE.

My Directors very generously granted an extra week's absence with full pay—in addition to their ordinary week's holiday—to all our men who are in the Territorial Army; and I would very strongly recommend all our members to prevail upon their committees or directors to do likewise, for I am sure the training and discipline of the men in camp and at their drills develops their manhood, and makes them better workmen and citizens.

NAPHTHALENE.

Throughout the length and breadth of our Island, Sheffield was, up to a few years ago, notorious as one of the places most troubled with naphthalene. Almost every nostrum that chemists could suggest had been vainly tried, until the naphtha processes, invented by Mr. Alfred Colson, of Leicester, and by Mr. J. Fergusson Bell, of Derby, were adopted. Since then we have felt masters of the situation; but with a view of economizing the use of naphtha during the winter months, when complaints had practically disappeared for the season, we had up till last winter discontinued using naphtha from about the middle of November till the middle of April. As our complaints from stoppages showed some increase last year, we decided to continue using solvent throughout the winter, to the extent of 0·10 gallon per ton of coal, and we hope to be in a much better condition next summer. This idea is borne out by the experience of several large provincial undertakings, which were almost free from naphthalene complaints last year—they having continued the process without cessation.

I have conclusive evidence that it is a mistake to condense the crude gas below 70° Fahr. until it has been washed with ammoniacal liquor to extract all the tarry particles. Up till the autumn of the year of 1901, we spent considerable sums of money upon increasing our foul mains, to bring about slow condensation and to allow the condensed products to travel with the gas, providing powerful condensers supplied with cold water from deep wells, and seldom in the hottest weather allowing the temperature at the condenser outlet to rise above 60° Fahr., with the result that the more we condensed the gas before we washed it, the worse we were troubled in the district with naphthalene. In the autumn of 1901, we raised the temperature at the outlet of the condensers to about an average of 75° Fahr., and our naphthalene complaints fell from 28,189 in the preceding year, to 5597 that year. These figures do not, in either case, include stoppages in the public lamps. It might be thought that by keeping the temperature at the outlet of the condenser so high as 75° Fahr., there would be a loss of ammonia; but our results have not shown this to be the case. We made 31·2 gallons of 10-oz. liquor per ton of coal, of an average strength of 8·83 oz. for the five years, before we resorted to high temperatures at the condenser outlet, and have made 31·60 gallons of 10-oz. liquor per ton for the five years since we increased the temperature, of an average selling strength of 8·86 oz. In 1904, we commenced to experiment with both the Bell and Colson processes, and have continued to use them since that date, with the result shown in the table hereunder:—

Year.	Number of Consumers.	Naphthalene Stoppages in Private Services.	Grains of Naphthalene in Town Gas, as Shown by Colman's and Smith's Tests.			Naphtha Used.		
			Per 100 Cubic Feet.			Gallons per Ton.		Cost per Ton of Coal over Whole Year.
			Max.	Min.	Avg.	During Time Process at Work.	Taken over Whole Twelve Months.	Pence.
1901	65,000	28,189	12·4	Nil	4·32	..	..	..
1902	68,649	5,597	5·9	Nil	2·19	..	..	..
1903	72,106	9,664	5·9	0·3	2·61	..	..	..
1904	75,482	8,787	7·9	Nil	2·62	..	..	..
1905	78,711	534	8·8	Nil	2·32	..	..	..
1906	83,177	673	5·1	Trace	2·46	0·168	0·086	0·623
1907	87,657	468	3·6	Trace	2·01	0·150	0·078	0·606
1908	91,902	3,114	4·1	0·5	2·02	0·179	0·116	0·659

I have frequently heard it stated that the naphthalene trouble occurring as it does in the summer and autumn annually, was due to the fact that the salt was deposited in the mains in the winter months and licked up by the gas in the warm weather—becoming redeposited in the services. I have proved to my own satisfaction that this is a myth; for, commencing with the year 1903, I cut bag holes about 8 in. by 6 in. in our trunk mains, varying in size from

48 inches in diameter down to 12 inches in different parts of the district; and on an average I have inspected these mains five times annually. To enable a thorough examination to be made in the interior of the mains, I used a piece of plate glass bedded on clay over the bag hole, having previously placed inside the main an electric light bulb attached to a portable accumulator. I therefore had a good view of the interior, and could readily detect any naphthalene crystals if these were present. I have seen mains quite free in the spring become frosted heavily with crystals in the summer and autumn, and again free from all trace in the early winter; and in only one case have I found naphthalene in the distributing mains before June, or after the end of November. Several times in the spring of the year, when we were most troubled with naphthalene, I have grounded some of our gasholders and examined their interiors, to see if there was any naphthalene deposited on the crown or framework, which might be carried into the mains when the gas was warmed in the holders by the sun shining on the crown, but have never seen any, except immediately over the inlet, or in the inlet pipe itself—where one would expect to find it, seeing that the pipe is surrounded by the cool water of the tank. We seldom experience any trouble with naphthalene in the works; but we sometimes find it in the Livesey washers, scrubbers, and catch purifiers, although not to any great extent.

ELECTRIC LIGHTING.

Our competitors are still to the front with their advertisements, depicting in one case a manufacturer standing by a gas-engine watching several men pull at the fly-wheel trying to start the engine, and on the other side the same manufacturer turning on the switch of a motor. But this should also be followed up by the face of the man paying the bills in both cases, the smile, I think, would be on the one who had to pay the gas bill against the one who had to pay for current. Another advertisement, which I have not seen publicly contradicted, was that inserted in the booklet issued at the Manchester Electrical Exhibition, written by Dr. Chambers, in which he stated that gas when burnt produced a large quantity of sulphuretted hydrogen. This is untrue, and is intended to deceive the public. I am sure I am safe in stating that no gas-works of any size would allow sulphuretted hydrogen to be present in the gas when it leaves the works; and gas in burning cannot produce it. I am sure this must have escaped the notice of the Chairman of the Manchester Corporation Gas Department, or he would have contradicted such an erroneous statement.

During the last twelve months, improvements have been made by electricians in the quantity and price of their light by the introduction of the Osram and Tantalum lamps, whereby the same amount of current will now give a much better light. We can, however, still easily hold our own, both as regards light and cost; for a 60-candle inverted incandescent gas-burner, using 3½ feet of gas per hour, at 1s. 4d. per 1000 cubic feet (Sheffield price), costs $\frac{1}{15}$d. per hour, or 4s. 8d. per 1000 hours, compared with a 50-candle Osram lamp, using 62 watts per hour at 4d. per unit, which costs ¼d. per hour, or 20s. 8d. per 1000 hours—showing a saving by using the gas-burner of 16s., or 78 per cent. with one-fifth more light. Now it behoves every gas manager to do his utmost to retain his present customers, and he can only do this by selling gas at rock-bottom prices. We must not be fettered with absurd restrictions as to candle power, &c., but be left to sell our commodity as good as we can, and at as low a price as possible. We are not now light monopolists, and may be trusted to satisfy our customers.

Where electric lighting is in the hands of municipalities, gas undertakings have to meet unfair competition on all sides. What with public lighting at exorbitant prices—far in excess of that charged for gas for the same or greater illuminating power—free wiring, and current for power being sold at, or less than, cost price, it seems of little concern to the electrical engineer how much capital he expends on cables and plant so long as he can show an increase in the units sold. Whether the revenue to be obtained from new capital expended will pay or not, he leaves posterity to learn. A prospective consumer has only to apply for current; and if it is within the area of supply, he will almost certainly be obliged, and, if necessary, a cable run for his use.

I was surprised to see in the local paper a few months ago that the Scarlet Fever Hospital, situated out on a bleak moorland, not far from Sheffield, was to be lit by electricity instead of, as at present, by coal gas. Now I should have thought if there was one place more than another where gas ought, for purposes of light, heat, and hygienic reasons to be retained, it certainly should be in a fever hospital, as the germs and skin particles, by passing through the gas-flame, are carbonized, a better circulation of fresh air is maintained, and the carbonic acid present in the atmosphere of the wards is thereby lessened, in addition to the warmth derived from the gas-flames, which warmth would have to be obtained from fires, or additional hot air or hot-water pipes, if gas were displaced by electricity. A loan of £1900 was therefore obtained, to replace gas by a private electric installation, with the stipulation that gas would be retained as a standby and for cooking. They estimate they will save £90 per annum; but we all well know from previous experience what the net result will prove.

The Sheffield Corporation Council Chamber is electrically lit, and members are frequently complaining of the impurity of the atmosphere therein. This was tested during a meeting of the Council last month, and found to contain 4 or 5 times more carbonic acid than is considered a limit for public halls. Here, again, is another instance of where gas would have given a better light at far less cost, and produced a purer atmosphere by causing a better circulation of the air.

It is generally found that where the electric light has been adopted for the lighting of churches, chapels, and other public halls, that the draughts and cold air currents are a serious menace to the comfort of the audience, and are almost unbearable. This can generally be remedied by introducing a few gas jets or gas radiators, and by doing so, we have in several cases cured the trouble.

Where large living rooms are lit with electricity, the occupants in the winter months must either be sitting very close to the fire, or become so cold as to be most uncomfortable. I need hardly say say this does not occur where gas is the illuminant.

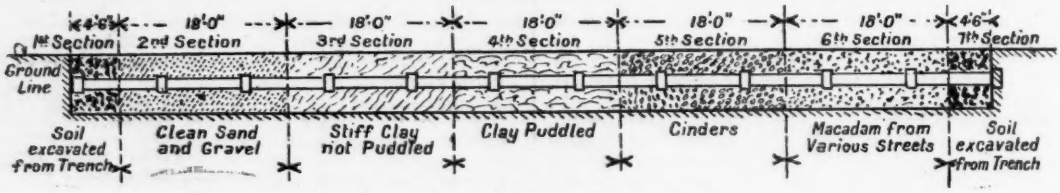
ELECTROLYSIS.

It may be remembered that the Sheffield United Gaslight Company were successful in obtaining the insertion in the Sheffield Corporation Act of 1901 of a clause providing that if it could be proved that any injury or damage was done to any of the Company's mains, pipes, or apparatus by fusion or electrolytic action by currents generated, or used for the purpose of electric traction, the Corporation should be liable to make compensation for such injury or damage. This clause was also made retrospective on work done under previous Acts obtained by the Sheffield Corporation; and, while rendering the Corporation liable for damage, left the onus of proof of such damage on my Company. Therefore, it was important that we should by careful tests ascertain: (1) Whether the regulations laid down by the Board of Trade, which are: "That the potential difference between the tram-rail and our mains should not exceed 1·47 volts"—that being the "E.M.F." of one Leclanché cell—were being adhered to; and (2), whether any damage was actually being done to the pipes.

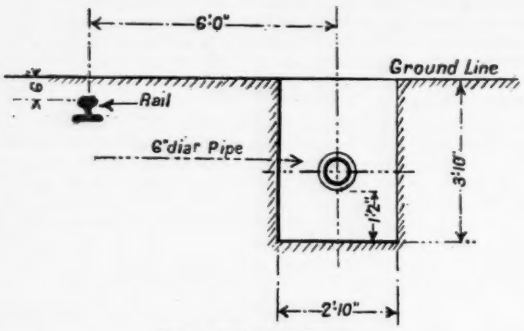
It was a comparatively easy matter to test for the former; but for the latter, an answer could only be ascertained by minute examination of the pipes themselves. We therefore selected several points where the tram routes converge, and also in the vicinity of the Corporation generating station, which happens to be fairly in the centre of the city. We have kept these specific points under observation since the beginning of 1902; making about three series of tests annually. In addition to these fixed points, we expose and test the mains at various places all over the district. With the view of making our tests and experiments as complete as possible, we decided to lay two lines of gas-main and pass current into one line, but not into the other, and thus ascertain if electrolysis would be rapidly produced when keeping within the limits laid down by the Board of Trade. We therefore dug two trenches at some distance from each other, 3 ft. 10 in. deep by 2 ft. 10 in. wide, at one of our works on the outskirts of the city, and about half-a-mile from any tram route. Into each trench we put various kinds of earth filling 12 inches deep, and then laid 100 feet of new 6-inch pipe, yarned and jointed in the usual way; each alternate pipe having been coated with Angus Smith's composition. We then filled up the trenches with the same class of material on March 13, 1902; and these pipes remained buried till April, 1904, or over two years. (See sketch next page.)

Parallel with one of these lines of pipes, and 6 feet away, was laid 100 feet of tram-rails, 6 inches below the surface, bonded together with the usual Chicago copper bonds to represent an ordinary tram track. Copper cables were then tapped into the ends of these rails and into the ends of the pipes to be tested. A recording ammeter and voltmeter, both of which were certified by the Board of Trade, were joined to the cables. Accumulator cells, having a capacity of 500 ampère hours, were connected through an adjustable resistance to the ammeter and to the pipes. Owing to the delay in obtaining the recording instruments, the current was not put into the pipes till five months after they were buried. Then current averaging 0·25 ampère was passed into one line of pipes, and the difference of potential maintained between the pipe and rail at a little under 1·50 volts from Oct. 3, 1902, to April 26, 1904, or 570 days. A continuous record was kept of the potential difference and of the current put into the pipes during the whole period. The electrical resistance of the pipe-line, just as it stood at the end of the experiment, which included ten pipe-socket joints, measured between two points each about 6 inches from the respective ends, was found to be 0·163 ohm.

At the conclusion of the tests, both lines of pipes, which, it will be remembered, had been in the ground nearly two years, were carefully bared without being disturbed, and minutely examined, with the following results: The first section was very rusty, but showed no signs of electrolysis. In the second section, the uncoated pipes were uniformly pitted all over with a number of small black specks, about ⅛ inch diameter, showing where scales were flaked off; but there was nothing perceptible on the coated pipes. The sand surrounding this section was found on analysis to show no trace whatever of acid, but, on the contrary, was slightly alkaline. The third and fourth sections showed no alteration. The fifth section was much eaten into, in the case of the uncoated pipe, probably owing to the action of the acids from the cinders in which the pipes were buried; but there was no perceptible action on the coated pipe. In the sixth and seventh sections, the uncoated pipe was slightly softened; but the coated pipe showed no effect. The other pipe-line, which had not been subject to any known electrical influence, was next examined, and showed results similar in every respect to those in the first line, including section



Longitudinal Section of Trench, with Six-Inch Pipe.



Cross Section of Trench.

No. 2, which, contrary to expectation, was found to be just as badly pitted as the corresponding section in the other line.

The above experiments were distinctly reassuring, as they show clearly that no immediate appreciable damage is done by pressure if the limit of potential allowed by the Board of Trade is not exceeded, although 0·25 ampère was known to be flowing continuously for over a year-and-a-half from a line of pipe 100 feet long. They also show the advantage of coating gas-mains with some protecting composition when they have to be buried in bad ground. In actual practice the pressure only reaches its higher values during a comparatively small number of hours out of the twenty-four, and is fluctuating the whole time. Hence the test conditions represent a very much longer time under working conditions than the actual period of the test.

With a view of ascertaining the resistance of mains of various sizes, and also of the lead and yarn joints in them, made in the usual way, we laid three lengths each of 6-inch, 8-inch, 12-inch, 20-inch, and 30-inch pipes on wood blocks supported on porcelain insulators. The resistances were determined by passing a known current through a known length of pipe and measuring the fall of potential across the joints, or across the pipe as the case might be, as follows:—

Size of Pipe.	Length Tested.	Resistance (Ohms).			
		First Joint.	Second Joint.	Whole Length of Pipe.	Taken in 6 Feet of Pipe, *ex* any Joint.
Inches.	Feet.				
6	27	0·0256	0·00585	0·0329	0·000328
8	27	0·0114	0·0091	0·0214	0·000216
12	36	0·0107	0·0012	0·0125	0·000109
20	36	0·00294	0·0023	0·0055	0·000041
30	21½	0·00440	0·00119	0·0057	0·0000521 in 10 ft. of length.

It will be seen that the resistance of the joints is very high relatively to the resistance of the pipe itself, also that the joints in each length differ widely from each other, probably caused through a difference in the surface of the pipes where jointed, and the density of caulking of the lead. Thus one joint had 17, and another 12, times the resistance of the other joint in a 6-inch pipe and 12-inch pipe respectively. Owing to the disparity in the results of the tests of the two joints on each pipe, it is impossible to arrive with any degree of exactness at the resistance of a mile of pipe as laid; but the table below gives the figures calculated at the maximum, minimum, and mean:

Size of Pipe.	Resistance of One Pipe as Laid on Insulated Blocks One Mile Long (Ohms).		
Inches.	Max.	Min.	Mean.
6	15·29	3·72	9·50
8	6·87	5·52	6·19
12	4·80	0·62	2·71
20	1·33	1·05	1·19
30	1·96	0·56	1·26

It will be seen that in all cases the current is moderate in amount compared with the currents which flow through the rails, or, in other words, the resistance of the gas-pipe is comparatively high. For comparison, it may be of interest to mention that the resistance of a mile of double track of tram-rails, properly bonded, is about 0·006 ohm, as against 0·56 ohm, the lowest resistance of any of the above pipes. By the tests taken of our trunk mains, we invariably find that the pipes are positive to the tram-rails—that is to say, the conditions are favourable to corrosion of the pipes if current passes between them and the rails—differing in potential from them by about one volt, the average being 0·87 volt, and that the potential, as laid down by the Board of Trade, is not now so frequently exceeded as it was when we first commenced our tests. We have, at odd times, however, found the potential as high as 2·50 volts; but on calling the attention of the authorities to the excess, steps have been taken to effect a remedy by laying additional return feeder cables, and in one case by putting in a negative booster to bring the potential at the generating station below earth potential. If the pipes were joined through a metallic conductor to the rails, a current of from half ampère to four ampères passed; the average being about 1·90 ampères. We also find that adjacent pipes differ from one another in potential to the extent of a few hundredths of a volt, the average being 0·037 volt; while the current that flowed when the pipes were metallically joined was a few hundredths of an ampère, averaging 0·055 ampère.

We have made altogether 148 measurements of the difference in potential and 146 measurements for current between our mains (varying in size from 4 inches to 48 inches in diameter) and the tram-rails, and 76 measurements for potential difference, and 78 for current, between various sizes of gas-mains; the average for the last seven years being as in the table below:—

We frequently find the current reversing when taken between two lines of pipes. There are in Sheffield about 70 miles of single-track tram-rails; and on an average about 200 cars are in daily use. The current is supplied at a pressure of 550 volts. We have 570 miles of gas-mains; and I am pleased to say that up to

Year.	Measurement Made between Rail and Pipes.						Measurement Made between Pipe and Pipe.					
	Potential Difference in Volts.			Current in Ampères.			Potential Difference in Volts.			Current in Ampères.		
	Max.	Min.	Average.	Max.	Min.	Average.	Max.	Min.	Average.	Max.	Min.	Average.
1902	1·80	0·60	1·21	4·60	1·00	2·851	0·120	0·008	0·062	0·520	0·013	0·101
1903	2·50	0·24	1·08	7·00	0·45	2·764	0·140	0·001	0·047	0·400	0·000	0·090
1904	1·10	0·22	0·63	2·60	0·25	1·565	0·048	0·002	0·026	0·170	0·004	0·053
1905	1·50	0·54	0·98	3·80	0·20	2·025	0·120	0·013	0·041	0·170	0·004	0·051
1906	1·80	0·10	0·70	2·50	0·20	1·248	0·160	0·000	0·025	0·260	0·002	0·031
1907	1·16	0·16	0·63	3·00	0·40	1·190	0·140	0·002	0·031	0·160	0·001	0·032
1908	1·74	0·16	0·85	4·10	0·07	1·586	0·140	0·000	0·027	0·260	0·000	0·031

the present time, although the cars have been electrically driven for over nine years, we have not had a single case of electrolysis—due, I think, to the care the Corporation took in laying and bonding their track and cables, and their desire to keep within the limit of potential laid down by the Board of Trade.

The tests have all been conducted under the personal supervision of Mr. C. H. Wordingham, M.Inst.C.E., M.I.M.E., M.I.E.E., the Electrical Engineer to the British Admiralty, who has acted as our specialist on this matter from the time we commenced our experiments.

And now, gentlemen, I thank you for the patience you have shown in listening to my address; and I hope that some of the matter contained therein will form food for future reflection.

At the close of the address, which was well received,

Mr. E. ALLEN (Liverpool) moved a vote of thanks to the President. He said he first of all desired to express his high appreciation of the new President. In Mr. Morrison they had a gentleman of very keen intellect and large experience in their industry; and he (the speaker) was sure that the Institution would benefit by his

occupancy of the chair during the year. It appeared to him that there was to-day a greater need for the existence of organizations such as theirs. The rapid march of the improvements in connection with gas manufacture made it necessary that every man in charge of gas-works should avail himself of every opportunity which presented itself for acquiring information. It was by such institutions as theirs that the gas manager could extend his knowledge, and keep in touch with new methods. Some of those in use to-day were not thought of ten—possibly not even five—years ago; and it was therefore necessary for gas engineers and managers to acquire as much information as possible in regard to the introduction of new processes and the modernization of old plants. It was satisfactory that their Institution was in so sound a financial position, and that their membership was increasing. There were still, however, a good many managers outside their ranks; and, without any disrespect to these gentlemen, he suggested that they would do well to become members. As to the address, he had one regret, and that was that they could not have a discussion upon it. There was in it almost a challenge to them; but they could not very well accept it at the present time. Still this did not prevent him expressing his high appreciation of the address, particularly the part dealing with research work in regard to electrolysis. It was gratifying to have such an assurance given to them as that contained in the address. They in Liverpool had had reason to apprehend danger from this source; but after hearing the President, he felt reassured. Still he wished the members could have had a chance of criticizing the address, as one portion of it seemed to him to contradict another. He thought that if at some future time an opportunity were afforded of discussing certain of the points raised, it would be to their mutual advantage. While making this suggestion, he must say that the address was second to none they had listened to in the existence of the Institution.

Mr. H. KENDRICK (Stretford) expressed his pleasure in seconding the motion, the more so because during the first fourteen years of his gas-works life he and Mr. Morrison were colleagues at Birmingham.

THE LIVESEY FUND—MOVEMENT TO SECURE UNIFICATION OF GAS TESTING.

Mr. THOMAS GLOVER (Norwich), the President of the Institution of Gas Engineers, supported the motion. He said he had often wished to be present at a meeting of the Manchester Institution, knowing as he did that it held a very high position among the District Associations, and did most valuable work from a technical point of view. There were several matters dealt with by the retiring President that were of great interest to him. There was, first of all, the question of the Livesey Memorial Fund. The fact that it had been decided to spend the money in a Northern University ought to appeal to Lancashire and Yorkshire gas men; and no doubt they would give the fund the full measure of their support. He was certain most thinking men would admit that the Committee, in deciding on the endowment of a professorship, had acted wisely, and that it would do a great deal for the future of the industry. They were satisfied that research work of the character indicated would be to the ultimate benefit of the industry to which they were pledged. He thanked the Manchester Institution for its grant of 25 guineas to the fund; but he hoped they would not stop there. He meant to say that the fund would be more valuable as a memorial to Sir George Livesey if every man connected with the gas industry were to put his hand into his pocket and give a subscription, no matter how small. Let them all take part in the fund, and feel that it was their own. He repudiated the suggestion that it had been the work of a coterie; for it was nothing of the kind. The organization of such a fund had to be taken in hand by a central body in London; and they could not be calling men from distant parts of the country to attend every meeting of the Committee. This he would say—that the Committee had done their best to secure a suitable memorial to Sir George Livesey; and he made a further appeal for subscriptions to the fund. On the question whether Corporations could legally make a grant to the fund, he pointed out that Glasgow had resolved to take the risk, and had already promised a subscription. So with Manchester, Birmingham, Huddersfield, and several others. He hoped that there would be more, for corporations, after all, were proprietors of their gas-works, just as were the shareholders of a gas company. There was one other point he wished to deal with, as showing that the Institution of Gas Engineers were looking after the interests of the industry, and that was the movement started to secure a unification of the standard for burners, which was very necessary. With regard to the address read by the new President, he considered it a most important contribution to their technical literature, particularly the latter part of it, which was devoted to electrolysis—a matter in which a great many of them were deeply interested. In this connection, he might mention that several serious cases had come under his own notice where the pipes were too close to the cables.

The motion having been carried,

The PRESIDENT thanked the members for their vote. Referring to Mr. Glover's remarks, he mentioned that at Sheffield, from the time electricity was first supplied, it was arranged between the Corporation and his Company, that it should be an instruction to always have the space of a brick between the gas-pipes and the cables and struts. This had a great deal to do with their keeping free from trouble.

MAKE AND SALE OF COKE.

Mr. ROBERT WATSON (Doncaster) then submitted a paper on the above subject. It will be found, with a report of the discussion upon it, on p. 615.

VOTES OF THANKS.

On the motion of the PRESIDENT, seconded by Mr. WILLIAM WOODWARD, votes of thanks were accorded to Messrs. Dempster for the facilities afforded the members to visit their works; to the Gas Committee of the Manchester Corporation for allowing an inspection of the Bradford Road Gas-Works; and to Mr. M'Elroy, the Corporation Tramways Manager, for placing special cars at the disposal of the party.

The votes were acknowledged by Mr. SCOTT (of Messrs. Dempsters), and by Mr. NEWBIGGING.

Moved by Mr. HALLIWELL, and seconded by Mr. H. BARKER, a hearty vote of thanks was passed to the retiring officials of the Institution, for their services during the past year.

The HON. SECRETARY (Mr. W. Whatmough) responded.

Before the meeting closed, the President extended a cordial invitation to the members to visit him at Sheffield during his year of office.

After the meeting the members took tea together; and later in the evening there was a reception by the President.

A New Incandescent Mantle Company.

The gas-mantle industry, like the great gas-supply industry which gives it sustenance, is in anything but a decaying condition. It flourishes, and there is no doubt whatever will long continue to do so. The fact that the business is one in which there is profit to be made, notwithstanding competition, is attested by more than one piece of evidence; but it is sufficient to learn that it is computed that some 80 million mantles are imported into Great Britain annually to assure that it pays to send mantles such a distance for competition in our markets, and that, if there is room for such a number of mantles annually from abroad, there is room, too, for more British-made articles of this class. It supplies subject for reflection, however, to hear that every drop of the thoria solution used in this country by mantle makers still comes from Continental sources. It is surely time that this condition was altered. However, that by the way. A new source for home-made mantles has been opened up by the formation of the Incandescent Mantle Company, with a capital of £30,000. This Company have acquired from the Official Receiver the assets of the old Buhlmann Syndicate. The works have been completely reorganized with the most up-to-date plant it has been possible to obtain; and it is now possible to manufacture at least 10 million mantles annually. The new Company are not proposing to exploit any particular mantle of its own, but will manufacture entirely for gas companies and the trade according to patterns and specifications supplied. The experience at the head of the concern is a very wide one. Special facilities, too, are afforded gas company's inspectors for visiting the works, examining the process of impregnating the mantles they specially require, and of testing samples taken from bulk on the spot. A feature under the new management is the production of a mantle particularly suitable for maintenance purposes, and as two of the Directors are gas engineers, great attention is paid to this department. The technical management is in the hands of Mr. Sheldrake; while the business department is attended to by Mr. Emerson. Any gas engineer interested in the technicalities of incandescent mantle making will, the Company desire us to state, be welcomed at the works, which are situated at Weston Street, Bromley-by-Bow, E.

Recent Wills.—Mr. C. P. Noel, D.L., J.P., of Bell Hall, Stourbridge, Worcester, the Deputy-Chairman of the East Worcestershire Water Company, who died on the 10th of November last, aged 78, left estate valued at £46,470 gross; the net personalty being sworn at £170. Mr. C. H. Williams, J.P., the Chairman of the Cardiff Gas Company, who died on the 14th of the following month, left estate sworn at £119,251 gross and £105,669 net. Mr. S. S. Hall, of Newcastle, a Director of the Sunderland and South Shields Water Company, left £15,586 gross. Mr. John Tweedale, a Director of the Mirfield, Scarborough, and East Ardsley Gas Companies, left £49,721 gross.

Water Supply of Kent.—The Board of Agriculture and Fisheries are directing attention to the publication of a memoir of the Geological Survey on the Water Supply of Kent. It deals very fully with the springs and underground sources of water in the county, contains a general description of the geological formations, with special reference to their water-bearing characters, and includes notes on swallow-holes, intermittent streams, &c. The main portion of the work comprises particulars of wells and borings for water, and records of other borings, notably those in the Kent coal district. Analyses of waters are also given; and there is an extensive bibliography of works relating to the water supply. The memoir is accompanied by a rainfall map of the county, with explanatory report and statistics. Copies may be obtained from the Ordnance Survey Office, Southampton, at the price of 8s. 6d.

SOCIETY OF BRITISH GAS INDUSTRIES.

The Annual General Meeting of the Society was held last Thursday, at the Waldorf Hotel, Aldwych, when there was a very good attendance of members. At the opening of the proceedings, the chair was occupied by Mr. DUGALD CLERK, F.R.S.

REPORT OF THE CENTRAL COUNCIL.

The following is the report of the Central Council, which was adopted:—

In presenting the third annual report to the members of the Society, your Council desire to express in the first instance the great loss the Society sustained in October last by the death of its much-esteemed President, Sir George Livesey, who thoroughly approved of its aims and objects, and was at all times ready to give the Society the benefit of his valuable advice, and his great experience in all matters relating to commercial affairs was of the greatest assistance.

During the past year good work has continued to be done, and the benefit of such a Society has become generally acknowledged and appreciated. By the co-operation of all the members, much more may be done in the future. It is hoped, therefore, that extended use will be made of the Society by all sections. The membership is steadily increasing—13 new firms having joined during the past year, making a total of 66 firms—and the Council wish to impress upon members the desirability of bringing the Society to the notice of friends.

Meetings have been held between the Institution of Gas Engineers and the Society on the question of standard clauses in contracts. These meetings were of a most cordial nature; and the Society had the benefit of the able leadership of the late President and Mr. Dugald Clerk. The clauses have been approved of by both sides, and now await a final meeting before being recommended for adoption; and the Council trust that the clauses will prove of great assistance and benefit to the members.

A memorial was presented in June last to the President of the Board of Trade praying that legislation might be promoted with the object of extending their powers in granting Provisional Orders and of simplifying and cheapening procedure under the Gas-Works Facilities Act. It is hoped that when the Bill becomes law, it will greatly benefit many of the members, and will be the means of furthering their business.

The Society was officially represented at the public meetings held during the year against the Coal-Mines Eight Hours Bill; and your late President voiced the views of the gas industry on these occasions. In March last, a strong protest from the Society was sent to the Home Secretary; but without result.

A conference on "The Standardization of Refractory Materials" has been arranged between representatives of the English Ceramic Society, the Joint Committee of Allied Pottery Manufacturers, the Institution of Gas Engineers, the Iron and Steel Institute, and our Society; and it is hoped that much good may result from their deliberations.

Your Council regret that the negotiations for a conference with the architects have not been brought to a successful issue. It was thought that many matters might be considered jointly by Architectural and Gas Engineering Societies, which would be of mutual advantage to all concerned.

The Society is fortunate in having secured as its President for the coming year Mr. Thomas Newbigging; and your Council look forward with confidence to continued success and increased usefulness under his guidance.

The Society is again indebted to Mr. Dugald Clerk for taking over the duties of the presidency during the *interregnum;* and the Council have much pleasure in announcing that he has accepted the Vice-Presidency of the Society, and take this opportunity of heartily congratulating him on being elected a Fellow of the Royal Society.

The financial position of the Society is satisfactory.

ELECTION OF OFFICE-BEARERS AND CENTRAL COUNCIL.

The following elections of office-bearers and representatives of the sections on the Central Council were duly made:—

President—Mr. THOMAS NEWBIGGING, M.Inst.C.E.

Vice-President—Mr. DUGALD CLERK, F.R.S., M.Inst.C.E, F.C.S.

Central Council:

J. W. BROADHEAD,	representing	Section	I.
T. S. CLAPHAM	,,	,,	II.
HARRY J. DONKIN	,,	,,	IIa.
FRED. J. WEST	,,	,,	III.
HUGH F. WRIGHT	,,	,,	IV.
JOHN MACKAY	,,	,,	V.
H. JAMES YATES	,,	,,	VI.
THOMAS G. MARSH	,,	,,	VII.
JOHN E. WILLIAMS	,,	,,	VIII.
H. N. BICKERTON	,,	,,	IX.
W. P. GIBBONS	,,	,,	X.

Honorary Secretary—CHARLES CLARE } *Ex-Officio*
Honorary Treasurer—H. M. THORNTON } *Members.*

Secretary—ARTHUR L. GRIFFITH, 46, Queen Victoria Street, E.C.

INDUCTION OF MR. THOMAS NEWBIGGING AS PRESIDENT.

At the conclusion of the general business meeting,

Mr. DUGALD CLERK thanked the members for being so good as to elect him that day their Vice-President. He said that he had taken a great deal of interest in the work of the Society; and he could assure them that he would have parted with them finally with a considerable amount of regret. Their action in making him Vice-President, however, meant that there would be no parting, though he had to retire to the comparative obscurity of the position of Vice-President, in place of that of President. But this was as it should be. He congratulated the members cordially on the good work performed (as shown by the report), and on the stable position of the Society. For their success, the Society were much indebted to the friendly co-operation of the Council and members of the Institution of Gas Engineers. There had been ample proof of this even that day in a meeting which had taken place during the morning of a Committee of both bodies. There had been several other meetings; and he had attended them with much interest and pleasure. He hoped that in settling other matters between the two organizations, the same course would be adopted. Now it was his pleasing duty to terminate his short period as Acting-President by installing in the chair a gentleman of world-wide reputation as a Gas Engineer. No words of his were necessary in introducing to them Mr. Thomas Newbigging. The great and honourable position Mr. Newbigging took in his profession was due to fifty years of work—practical, scientific, and literary. It was a happy augury for the future harmony between the different bodies of the gas profession that the new President was in 1885 President of the Institution of Gas Engineers. He had great pleasure in handing the members over to Mr. Newbigging's keeping; and he wished the President and the Society an interesting and useful career together.

Mr. THOMAS NEWBIGGING then took the chair, amid loud applause, and at once proceeded to deliver the following

PRESIDENTIAL ADDRESS.

Gentlemen,—While thanking you sincerely for the high honour you have done me in electing me to be your President for the year, I feel that it is a hard task to follow two men so distinguished in their several walks as both of my predecessors. I have been accustomed to sit, an admiring learner, at the feet of both Mr. Dugald Clerk and Sir George Livesey—the one an engineer and scientist of wide-reaching and balanced judgment, the other an engineer and administrator such as one hardly encounters twice in a long lifetime. While we lament the loss of the one, we rejoice that the other has comparative youth on his side; and we hope that he has a long career of useful work in front of him.

I have elsewhere spoken of the worth of our departed friend and late President, and I will now only call attention to one or two phases of his character. Among the admirable qualities which distinguished Sir George, is to be reckoned his tenacity of purpose in whatever enterprise he took in hand. If defeat awaited him for a season, he rallied again with redoubled force and energy till his purpose was accomplished. And then, too, his sympathies extended in many directions and to many objects beyond his immediate professional work; while the causes he espoused were good causes, viewed from his own standpoint, and also from that of many others as well. This Society has a special call to lament the death of our friend, inasmuch as he was taken away when only about one-half of his year as President had elapsed. But life has its compensations. The removal of a great man affords room and opportunity to test the metal of those that remain. This, no doubt, is the spirit that should animate us, while doing full justice to the memory of the departed.

But I hark back to my position to-day, and I say that it is all the more difficult to follow Sir George in the presidency of the Society by reason of the high ideals which he placed before you, and to which he claimed your devotion, in his address of last year. I am sure you are ready to sympathize with me in the disadvantage under which I labour.

In preparing a Presidential Address to be delivered before an intelligent and critical assembly, one is naturally ambitious to go one better than one's predecessor, if possible. It is not possible on this occasion. Our late President brought the pulpit into the forum, and touched the very highest mountain-peak of obligation and duty to which anyone can aspire or attain in conducting a business; and it would seem as though a successor—especially an immediate successor—must speak from a different level. I almost feel, then, and I fear you will look upon me before I have finished my year of office, as a kind of scapegrace of the family—a character described with great humour by the Lancashire poet in his poem entitled "Our Folks." He says (with some slight difference on which I have ventured):—

> Our George has ta'en to preaching,
> He's a toper at it, too;
> But then—what's th' use?—our Tom comes in
> And swears it winnot do;
> When t'one's been striving all he can
> To alter wicked men,
> Then t'other makes some marlocks, an'
> Converts 'em o'er again!

Now although it is the farthest thought in my mind to try and convert you back again from the high moral precepts of the Gospel—from any counsel of perfection, though almost too bright and good for human nature's daily food—yet it is evident, to me at least, that the ideals previously set before you, and which are still in your remembrance, will dwarf whatever I may say to you to-day. To be sure, following such a distinguished lead, I might have chosen that other text from Holy Writ: "Seest thou a man diligent in business? he shall stand before kings; he shall not stand before mean men," and have given you to-day an inspiring

dissertation on that appropriate theme. After all, it would be presumption on my part to offer advice on the conduct of business to an assemblage such as I see before me, consisting of about as shrewd men of business as any in this land.

I understand that you have now within your organization the majority of those engaged in the manufacture of gas appliances; and I am glad that this is so. I should be inclined to say that such of your *confrères* as yet stand aloof are hardly loyal to the industry in which you and they are so largely concerned. The objects of the Society are all good and laudable, and therefore are well worthy of combined effort to realize. The only wonder to me is that the idea of such an organization should not have been entertained and carried into effect years ago. Now that it is an accomplished fact, it must not be allowed to languish for want of willing support. It is not a bad thing even for competitors in business to mix up with their rivalries a little of the milk of human kindness and brotherly feeling; and your meeting together at intervals enables this to be done.

But though yours is quite a young Society, the industry with which you are all less or more associated is over a hundred years old; and during all those years it has had a constantly expanding growth. The importance of the gas industry, its multifarious character, from large engineering structures, apparatus and machinery, down to the most ingenious and delicate of measuring and testing instruments, and the various appliances for the more immediate production of light and heat, must be obvious to all who have given the slightest consideration to the subject. To all the infinity of detail required in the equipment of a gas-factory—more, I think, than in any other single industry—a great many wise heads have been at work all these years, and are hard at work to-day. Gas engineers and managers have good reason, and I hope they are not slow, to acknowledge the indispensable assistance they have always received from those who constitute the army of apparatus manufacturers. It would be sheer ingratitude otherwise; for the inventive genius of many minds, in addition to their own, has contributed to the successful working results that have been achieved.

The mild winter we experienced to the end of last year, and the indifferent general trade, have had their effect on the gas industry; the result being that in most cases there is not that high percentage growth in the gas consumption which otherwise would have been the case. The effect, again, has been to cause a slackness in your business as contractors and manufacturers of apparatus, seeing that gas engineers, and gas authorities generally, are inclined to rest on their oars and wait events before making even needful renewals and extensions of works. But this is an unwise and short-sighted policy on their part, though it is often adopted. On the other hand, there are long-headed engineers who avail themselves of such a lull in business to place their contracts—and this to the marked and permanent advantage of the concerns under their management. Foresight of this kind is a commendable quality in an engineer, besides its tendency in the direction of steadying the market. And how much better it would be if we could insure a steady trade without leaps and bounds on the one hand and weeks and months of blank depression on the other! To say the least, it is worth an effort to insure it, and, certainly, forethought on the part of engineers would go far towards bringing it about.

I confess that I have much sympathy for the manufacturer and trader in slack times, struggling to keep his workmen employed in the face of adverse conditions; a heavy wages account to meet week by week, and all the other multifarious expenses of a big establishment. I often think, too, that if there is one man more than another deserving of sympathy, it is the commercial traveller calling to solicit custom, and to be met, nine times out of ten, with the reply that you have nothing either in hand or in prospect—things are bad, consequently no extensions are being made. If it were not that hope springs eternal in the human breast, the life of such would hardly be worth living. If one class of mortals more than another realizes the fact that hope deferred maketh the heart sick, it is the man in search of orders when orders are scarce. Now I can truly say—and I do not mention it in any spirit of self-praise, but to promote the kindlier virtues—that on no single occasion in my professional career have I ever coldly repulsed such a man from my office door. If I had no work in hand of his special kind, nor orders to give out for his particular appliances, at least I have given him a kindly word of welcome and sympathy, or, possibly, I have encouraged him by saying that I had considerable work in his line that would shortly be made public, and that he would be asked to tender for it in the ordinary course. In a word, I have made it a rule to kick him downstairs with such exquisite grace that he thought I was handing him up! And that, surely, is the very least that one ought to do under the circumstances. After all, sympathy—even if it is not possible for the oil and the two-pence as well to be always forthcoming—is a fine salve for many of the worries and troubles of this life.

When the gas industry is mentioned, the general public are apt to limit their ideas in respect of it to the production and sale of the subtile fluid which they use for lighting and heating purposes, scarcely recognizing that in this industry is embraced the designing, construction, and erection of great engineering structures, with machinery and apparatus of a complex character, on the perfecting of which much ingenuity and skill have been, and are daily being, expended. These are provided by the members of this Society, and every gas engineer knows and acknowledges how well he has been served by the different firms, and how indispensable this co-partnership is to successful working results in gas manufacture and supply. The competent gas engineer has the grip of the designing, construction, and usage of all this complex structural work, machinery, and plant; and high engineering abilities, both civil and mechanical, with much added chemical knowledge, are needed in the man who excels in that profession.

Did I say that it is the general public who take this restricted view of what gas engineering implies? Even so. But there is the fact—more notorious still—that this great industry was never represented on the Council of the Institution of Civil Engineers by a Gas Engineer, exclusively so engaged, until the election thereon of your late President, although repeated attempts were made to obtain such representation. A strange circumstance, truly, when account is taken of the vast capital (I won't venture to estimate how many hundred million pounds) which has been expended on gas-works, and embarked in works for the production of gas-works machinery and plant.

A strange circumstance, indeed, considering that gas securities stand in the very forefront of steady dividend-bearing investments. In this respect they are not excelled, even if they are paralleled, by any other class of investments in this or any other country. And yet the Institution of Civil Engineers has never had, until very recently, upon its Council a single representative of our branch of engineering. The discredit for this anomalous state of things assuredly does not rest with the gas industry—unless, indeed, it has been too supine to claim its rights.

Is it because it has no fitting representative capable of holding his own in engineering ability with the other Members of Council? This cannot be urged as a reason. I venture to assert that among the members of this branch of the engineering profession there have been, and are to-day, men who do credit to the name of engineer in whatever sense it may be applied. The whole course of the gas industry from its inception down to this hour affords irrefragable reason for the claim I now make. Apply any test that you like—age, importance, its contributions to civilization and humanity, its economical and fruitful capital expenditure, its immunity from engineering failures, or its public reputation as exemplified in its stability as a source of investment—the gas industry does not fail in any of these tests, apply them as stringently as you may. Or, again, reckon up its representative engineers from the days of Murdoch down to the time of our dead friend and late President, and they will not suffer by comparison with those of any other section of the civil engineering profession. I say, further, that so long as this important industry is without representation at the Council Table of the Institution, to that extent the Institution itself is lacking in representative quality, and that to its own disadvantage.

The Institution of Civil Engineers, to which such of us as are members feel it an honour to belong, should be the last organization in the world to make itself, or allow itself to be made, a close corporation, to the exclusion of a representative of any of its co-ordinate branches from the rank of its Executive. If reform is needed in the *modus operandi* of election to a seat at the Council Board—and I hear mutterings of the kind—then in this direction of more ample representation, reform is imperative. I can speak thus plainly about the very patent grievance that we as gas engineers feel, as I have no personal ambitions to serve. If ever I had in this regard, the day has gone by.

A notable event has recently taken place, and one that may well have far-reaching consequences as concerns the gas industry. I refer to the Chair of Gas Engineering and Fuel, which has been founded by the University of Leeds. This is the first recognition by any University in this country of the industry with which we are all associated—the first to offer a diploma and a degree in gas engineering. Our late President, Sir George Livesey, as we all know, interested himself in this action of the University; and it was mainly through his influence that an annual income, amounting to about £400, was obtained. This, manifestly, is not an adequate income for the support of such a Department; and, moreover, it is of a tenure too precarious and uncertain to warrant the bold research with which it may be expected to grapple. Professor Bone, F.R.S., has been appointed Chief of the Department; and he, as I know personally, is greatly competent for the position and full of enthusiasm for the work he has taken in hand.

You are all aware, of course, that at a meeting called by the Council of the Institution of Gas Engineers, and held in London on Dec. 10 last, a unanimous vote was passed in favour of the endowment of this Chair by way of memorial to Sir George Livesey; and steps are being taken to raise a sum of not less than £10,000 (I earnestly hope it may reach £15,000) for the purpose. The gas industry in all its branches is equal to such a reasonable demand, and will, I feel assured, rise to the occasion in grateful acknowledgment of the generous and wise policy initiated by this, one of the youngest, but not the least active and enterprising, of the great Universities of this country.

I wish that my words could reach the ear of every person interested in gas supply—both directors, stockholders, and others. No narrow views should be allowed to influence them in the decision to which they may arrive in regard to the project. A wide and generous response should put the financial question beyond cavil. Depend upon it, the economical results that must follow research work in the domain of pure science, and the practical work in the way of lectureships which have been organized, and such as a University with adequate means can undertake, will be of incalculable value to the gas industry in the not

remote future. I am sanguine that the University, in addition to other important questions, will complete the economical solution of the smoke difficulty. I say "complete," because it is already on the way to solution. I know from personal observation that there is a marked improvement in the atmospheric conditions in our large towns during the last twenty years—and this chiefly owing to the usage of gaseous fuel instead of solid.

There is no need to labour the points; but by way of summary I say the research work of the Department, besides dealing with other immediate practical problems, will thus in a large measure be concerned with fundamental questions underlying the application of gas for power and heating purposes, the solution of which is so important for future development and progress. It will be a chief function of the Department to investigate and expound new facts and principles in such a manner as will facilitate and insure their application in the industry. Work of this kind can best be done in a department of applied science associated with a University situated, as in Leeds, in an industrial environment. The more of this the University is enabled to do, the sooner and more certainly will developments follow outside. Hence the absolute necessity of ample funds. The enterprise shown by the Leeds University Authorities, in their recognition of one of the staple industries of the century, and which has been only too successful to have escaped envy and sometimes detraction, is, I venture to suggest, worthy of acknowledgment beyond the bounds of the United Kingdom. In English-speaking countries abroad—and more particularly in America, where the industry has assumed gigantic proportions—pride will be taken in this action of the University; and if that pride took the shape of a contribution to the endowment fund, which it well might, while occasioning no surprise here, it would be another link in the sympathetic chain binding the peoples together.

It is surprising in these enlightened times to observe that, when a contract for any considerable work is about to be given out by a local authority owning the gas-works, and, indeed, in any other department, a clamour is immediately raised in favour of letting the work to some local firm at even a price higher than that at which an outside competent firm is prepared and offers to undertake it. I do not hesitate to say that this is a policy which is rotten at the core. If it were widely adopted and acted upon, it would put an end to honest competition, and would cut at the root of freedom of contract without benefiting the community in any degree whatsoever. On the contrary, its result, as will be seen at once, would be to restrict the labour conditions of the very towns that adopted it, inasmuch as the manufacturing firms in such towns would be shut out from obtaining contracts elsewhere. What is sauce for the goose is sauce for the gander all the world over. This is a question which concerns this Society in a very direct way; and I feel sure a vicious and narrow policy of this character would be discountenanced by all its members.

In mediæval times, as all readers of history know, it was the policy pursued by the great Italian towns, cities, and provinces. These were hedged round by restrictions that sapped their very manhood. Florence, Pisa, and the rest—communes or republics as they were called—were at daggers drawn. Bad blood was generated in each against the others, with interminable feuds and hatred, and even bloodshed, as a consequence—the people whom it was supposed to benefit suffering the main brunt of it all.

I do not take the adverse view of the Coal Mines (Eight Hours) Act that some of our friends do. Far less do I look upon it as a "pernicious" Act, an "iniquitous" Act, a "suicidal" measure, all of which epithets have been used with (to quote Falstaff) "damnable iteration," in its christening. On the contrary, so far as I can bring my reasoning and prescient faculties to bear upon the question, I believe that its ultimate effect will be to steady labour in coal mines. There will be less of the spasmodic, and often reckless, labour that has prevailed hitherto. Men, instead of working only three or four days a week, and nine hours or more per day, will find it to their advantage to work the statutory hours during each week-day. This will tend to sobriety, to regularity of habits, to improved health, to a wider self-respect among the workers, and to greater immunity from accidents.

Some of the leading members of the gas engineering profession have been bitter in their denunciations of the Act. I cannot follow them in this. I do not believe that its ultimate operation will have the effect of raising the price of coal. "Don't prophesy unless you know" is a wise axiom, and a safe one to follow. Acting on the advice, I have no wish to assume the *rôle* of prophet. But it is permissible to exercise one's foresight; and my view accordingly is that it is more likely to tend in the opposite direction. But assuming that the Act may affect the price of coal temporarily in some degree, I do not know of any other so patent outlet for the application of "The Golden Rule of Human Conduct" than is here open to us to exercise—though, unfortunately, where self-interest comes in, the said rule has often to go by the board: "If self the wavering balance shake, it's rarely right adjusted." The collier's trade, with its darkness, discomforts, and dangers, and all its terrible risks, if not the only one, is certainly the occupation that most calls for the ameliorating hand of humane legislation. There are signs that the depression in trade is passing; so that even if the Act should entail some sacrifice on the part of the country, what then?

> A daimen-icker in a thrave
> 's a sma' request;
> We'll get a blessin' wi' the lave
> And never miss't!

If coal is to be cheapened in price (as it well might, and to a wider *clientèle* than even the gas industry—to British humanity and trade at large), there are other more substantial footholds from which to attack the problem. Let us turn our attention to the question of royalties. There is ample room and verge enough here to engage all our energies. I note that the usual periodical Jeremiahs are abroad with their lamentations of the probable exhaustion of British coal supplies. The idea of some of these is to conserve the coal in the bowels of the earth for the benefit of future generations. Even some of those who aspire to be among the foremost scientists of the day take this miserable, unpractical view of conservation. They are evidently oblivious of the *reductio ad absurdum* in which they are landed as the logical conclusion of their argument. I need not state it to an intelligent assembly. Believe me, there is no conservation that is worth a moment's thought except the conservation that ensues from the full and economical and perfect utilization of the mineral. That is the end at which to aim; and this is the end at which gas engineers at least are constantly aiming. Any other supposed conservation means immediate loss; and it is the fallacy of weak or illogical minds. I claim for the gas industry that in this matter of full utilization it stands in the very forefront. Go into any well-managed gas-factory and show me where there is any waste. There is none!

Exhaustion of our coal yield is inevitable at one time or another. No jeremiads will post-date the time. Long before the possible period of exhaustion has arrived, prices will have gone up unless there is some counteracting provision. One thing we may be sure of—the resources of civilization and of Nature will not be exhausted. In the meantime, don't attempt to punish and penalize present and immediate generations for the supposed—and falsely supposed—advantage of those in the future. But to attempt it would be futile. It is *ultra vires*, as the lawyers say. It cannot be done. If we are doing the best for ourselves and for our neighbour, we are doing the best for posterity.

There are other subjects on which I might have spoken a word, but I must not weary you, as there are other matters to engage our attention. I will conclude by pointing out that the Mechanical and Engineering Arts, with one important branch of which we here to-night are all associated, have been the greatest civilizers that the world has known. In face of their gradual development the unreasoning belief in the fabulous creations of earlier times gradually faded, or was retained only by the grossly superstitious. Myths of the old time character are not invented in these wider-visioned days. The inventive faculty, freed from the superstitious element, has taken a new direction—has found fresh objects, if less poetical, to engage its attention. It deals less with the spiritual and the unseen than with mundane things. Perhaps the spiritual eye within us is more dulled than in days of yore. We think less of fabulous creatures than of what we can see and touch and handle. However that may be, instead of myths, the inventions and discoveries of the later day are engines of various kinds, illumination mediums, railways, sewing machines, breech-loading firearms, mailed vessels, the telegraph, the telephone, coal-tar products, motor vehicles, flying machines, the X-rays and radium—the latter, strangely enough, holding out the promise of that long-sought-for desideratum, the transmutation of metals, but which, after all, is no new thing under the sun, when we remember that you transmute the baser metals, and even the very clay, into gold, every day.

James Watt, by his invention of the steam-engine, perfected by William Murdoch, the first gas engineer, and Watt's veritable right hand, gave the quietus to the credulous. His invention smote it by reverberation. Unconsciously, he proved an iconoclast. There was an awakening from Watt's day forward. The occult Arts suddenly lost their foothold and the Sciences of astronomy and chemistry threw off the husks that had trammelled them. The light of Watt's accomplishment gave an impetus to practical research, and a clearer day, though at first unrealized dawned upon mankind. Instead of the vagrant and unbridled spirits of the imagination—spirits of the air, earth, water, and fire—having free license to follow their bent, he yoked and harnessed them to work; he infused them into inert matter, and, ever since, they have been doing the drudgery of mankind. The spirit of invention, thence entering on its adolescent manhood, took possession of the human mind, and the wonders of the Nineteenth Century were gradually evolved.

And, finally, what of this Society? Its members are engaged in many diverse sectional branches. You have all heard of Corinthian brass, and most of you know what it is. For the benefit of those who don't, I may state that when the great Temple at Corinth was destroyed by fire, the vast number of statues and other works in iron, bronze, silver, and gold with which it was adorned were all melted by the intense heat; and the various metals, in their state of fusion, running together, the result was the production of an alloy of the rarest kind. It goes by the name of "Corinthian Brass" to this day, and it was, and still is, greatly valued for its remarkable qualities.

I will not presume to determine who among you are the iron, or the bronze, or the silver, or the gold; but whichever you are, or were, you have become fused and united by the heat of friendship into this Society, whose anniversary we are now commemorating. My imagination enables me to see that, if judiciously administered, it is destined to have a famous future history. We are not working for our own special industry only, but for engineers and contractors generally, and everywhere. It is not the first time that

the gas industry has led the way. This is an incentive to effort which may well be an inspiration and a stimulus to us all in our labours.

Mr. T. G. MARSH said the Chairman of the Society had called upon him to say a few words; but he was sure it would be almost an impossibility to criticize in any way adversely the beautiful address that his old friend—if he might be permitted to call him so—Mr. Newbigging had just given them. There was, however, one thing which was very striking to him that Mr. Newbigging had called attention to with regard to the gas industry—and that was where he pointed out the fact that there was nothing wasted in a gas-works, and that a gas-works sent out less smoke into the atmosphere than any other works. Mr. Newbigging had also called attention to the fact that the day would come when their coal would be exhausted. There was no doubt about it, the coal-fields must be exhausted eventually; but there was no reason why they should be exhausted any sooner than could be helped, and therefore they must thank Mr. Newbigging for having given them the hint that gas-works burnt the fuel in such a manner as to send out no smoke at all. He thought their Society could very well ask the members of the various Gas Managers' Associations to help them in making the measures as stringent as possible throughout the country for preventing the sending of smoke into the atmosphere. It was the duty of gas men to do this. There was no doubt that heat could be obtained much more efficiently than by simply wasting coal. Their late President, Mr. Dugald Clerk, had been prominent in bringing this forward. It was no new thing. From the time of Bramwell and Siemens to their friend Mr. Dugald Clerk, they had been shown that it was possible to get an efficiency that was altogether out of the question with steam. Yet they had never banded themselves together, and said: "We will not be poisoned for the purpose of enabling these people to go on in the old wasteful manner." Now the great difficulty had always been that research men and experts were seldom enthusiasts; and he would much like for some of the younger members of the Gas Managers' Associations to add still further to the benefits which they owed them so much for by giving them papers suggesting how gas could be used for purposes other even than for power. There were so many purposes. If they would only do this, and raise a certain amount of enthusiasm, he thought the local authorities would then step into the breach, and say: "We will have no more of this smoke." It was naturally better to have clean air than to have it full of carbon. Pure air was quite as important to them as pure water. They had heard a great deal about pure water; but this was perhaps because people saw the water regularly polluted. The gas in the atmosphere, the sulphur, and the carbon they only saw at a time when there was a certain vapour in the air—when there was a fog. They only saw them then; but they had the results with them for years, in the shape of bronchitis and the thousand-and-one of those ills which they met from them.

Mr. T. S. CLAPHAM referred to Mr. Newbigging's expression of sympathy with commercial men, and instanced an experience of his own with the President in his early days, and the kindly treatment he received from him, as showing how keen this sympathy really was.

Mr. A. P. MAIN thanked the President for his most interesting address, and said he had only "a sma' request" to make, which he was sure could be complied with. Mr. Newbigging had quoted a few words from Burns. Perhaps for the benefit of the company, he would translate "a daimen-icker in a thrave."

Mr. DUGALD CLERK remarked on the pleasure he had derived from listening to the address, which ranged from the question of civil engineers to that of radium. Very few subjects that had interested them in modern times had been omitted; and they had all been touched upon with an originality which was to him perfectly delightful. He was in agreement with Mr. Newbigging on almost every point, and in complete accord with him in regard to the Miners' Eight-Hours Act and the question of royalties. Mr. Newbigging and he were also very much of the same frame of mind in reference to some matters of political economy which were not mentioned in the address. As to one very important point touched upon by the President—the ultimate exhaustion of coal—Britain and the world generally were in the same position. The time must come when all the coal, not only in Britain, but in the world, would have come to an end; and a further time must arrive when, not only the coal, but every other source of energy within the solar system would be ended. He thought Lord Kelvin fixed the latter event at sixteen million years hence; so that they might, in any case, leave the consideration of this to posterity. But the subject of the loss of coal was a much more serious one than the ultimate disappearance of the earth in the sun, which was supposed to be their final fate; and many ingenious men—scientific and practical—had devoted themselves to the question of what was to be the source of power when the coal was finished. He quite agreed with Mr. Marsh that the more they economized their fuel—not stinting its use, but employing it wisely and well—the better it would be; and a part of his life's work had been devoted to finding out the laws of the conservation of energy as regarded engines. Many men had devoted attention to the subject of economizing fuel; and this was legitimate. Stinting the resources of any particular country at any particular time was, however, bad political economy. They had to look forward to the exhaustion of all forms of energy; and then they would come to be an agricultural country, depending upon what they grew, and the population would shrink from forty-two millions to eleven or twelve millions. Probably this would be their fate after all their sources of energy were exhausted. But meantime the Englishman—and he might claim to include the Scotchman as well—had the resource and determination which had so long kept him at the head of the world. He was not one of those who believed that foreign nations, or even America, were at all superior to the British in inventive capacity; and so far as he could see, the process of losing motive power would be a very slow one. For instance, even supposing the coal was to be exhausted, it would still be possible to raise a very considerable amount of wood, as was done in days gone by, when the iron industry was centred in the Wealds of Surrey and Sussex, and the iron of this country was obtained by the use of charcoal for the furnaces. Coal was not employed at all in those early days. He believed that when they were forced by necessity to find some other source of heat and energy than coal, they could use charcoal to provide everything they wanted. They should not waste heat, and should employ the most efficient form of engine for all power required. One ingenious friend of his—the Hon. C. Parsons, the inventor of the steam-turbine—in an address given at the Cambridge meeting of the British Association five years ago, had been so impressed by the problem of the loss of coal, that he had reasoned out a scheme for utilizing the internal heat of the earth to produce energy. His opinion was that if one dug a hole about 10 miles deep into the earth—he believed 10 or 12 miles was the limit—he would come to a temperature of such a height that, by using conducting rods, a large amount of energy could be secured from the earth. Of course, the store of energy in the cooling of the earth was considerable. He thought Mr. Parsons had estimated that this tremendous hole would cost something like £80,000,000, and would take forty years to dig. Therefore after all, though it was interesting as a speculation, it did not appear practical. Many scientific minds had devoted themselves to this subject; and their friends the chemists had even turned their attention to the time when there would be no more ammonia and no more phosphorus in the world, and it would be necessary to consider some way of getting nitrogen for raising crops. However, he must not go through all the items of the address. Every point gave one food for thought—sometimes in agreement with, and sometimes differing from, the author—and there were far too many to discuss that day. He was sure they would all agree with him that it had been an intellectual treat to listen to the address. Mr. Newbigging had so beautifully adjusted the combination of science with wit and humour, that he (the speaker) had never spent a more entertaining hour. He was entrusted with the pleasant duty of proposing a hearty vote of thanks to their President.

The proposition having been carried by acclamation,

Mr. NEWBIGGING, in reply, said that when Mr. Clapham was referring to his first adventure with him in his office, Mr. Dugald Clerk whispered that that was the bread which he (the speaker) had cast on the waters returning after many days. He had quite forgotten the circumstance; and it was very kind of Mr. Clapham to recall it. Then Mr. Main wanted him to explain the meaning of Burns's expression:

> A daimen-icker in a thrave
> 's a sma' request;
> We'll get a blessin' wi' the lave
> And never miss 't.

A "thrave" meant 24 sheaves of corn. Burns, they would all remember, was an agriculturist; and he wrote these few lines in a wonderful poem addressed to a mouse whose nest he had turned up with his ploughshare in a field. He said that some people would complain that the mouse ate the corn, and therefore it was better out of the way and destroyed. Burns, however, declares that "a daimen-icker in a thrave 's a sma' request." The "thrave," as he pointed out, was 24 sheaves of corn; "daimen" meant now and then; and "icker" was an ear of corn. Therefore what Burns argued was: "An ear of corn in 24 sheaves now and then is a small request; we will let the mouse have it, and get a blessing with the remainder." He had heard some one explain that "thrave" meant in a time of thriving; but this was not so. He had been much interested in Mr. Dugald Clerk's remarks on the various devices for replacing coal in the production of heat and in other ways. As Mr. Dugald Clerk said, at one time they did not get coal at all. This was in the spacious days of Elizabeth, when England destroyed the Spanish Armada. With regard to going down to the heat in the earth, long before they got to the central fires they would have to go through the liquid part of the business; and he did not know whether they would not have a chance of there coming across the inexhaustible supplies of petroleum which extended hundreds of miles beneath the sea. But before this time came, they would take care that there was no royalty to be paid for it. He had an idea that this was a possible resource which they had "up their sleeve." However, the matter was not worth troubling about now. He thought perhaps some of them would have said, "Put a tax on coal, to prevent it going out of the country to an extent." What would be the effect of a tax on coal of 2s. or 3s. per ton? It would reduce the price at which the coalowners would have to sell it in competition with foreign mines; it would reduce the number of vessels carrying it abroad, and there would be less imports in consequence of the number of ships' bottoms being reduced. Whichever way they looked at the matter, a tax was perfect folly; and though they sent out 25 per cent. of their coal supply, a lot of this went to their own coaling-stations.

Anyway, this export did not make much difference if the coal was going to be exhausted in 200 or 300 years, because long before that they would feel the pinch. In the meantime, they must not penalize either their own exporters or their own coal-miners. If those who advocated the saving of the coal for future generations would only be consistent, they would shut up the mines altogether, and get rid of the present generation of miners, either by starvation or deportation. This was what their argument led to. It was bound to be that. At any rate, if they did not go to this extent, they went some way towards it. They were on the road to this conclusion—there was no other. There was nothing for it but utilization. They should utilize the coal to the greatest advantage; but they could not prevent it being got, so that it was no use making a song about it. Let them do the best they could under existing circumstances. Mr. Marsh was a great authority on the destruction of daylight by smoke; and he (the President) was glad to hear his interesting and true observations. He hoped that the younger men connected with the different Associations would take up this matter to quite as great an extent as the more technical part of their work. They should consider this question, think about it, write about it, agitate about it, and he was sure that much good would result. He, however, looked to the University of Leeds as being the great source from which future advance was to come. He felt most sanguine about this; but instead of £10,000, they ought to have £15,000 at least to endow the Chair. Even the larger sum, at 4 per cent., would only mean £600 a year. No, £10,000 was not enough; it must be £15,000. He was sorry that some narrow-minded Directors had decided that they would give nothing to the fund. To his mind, it was a disgrace for any company—especially a large company that had done well in the past, paid maximum dividends year after year, and so on—to say that they would give nothing, or at any rate only a mere trifle. It was outrageous. He did hope they would take a thought and mend. In conclusion, he thanked the members for their unanimous and kindly vote.

ANNUAL DINNER.

Including guests, representing principally the Institution of Gas Engineers and the District Gas Associations, upwards of 100 were present at the annual dinner in the evening. The PRESIDENT took the seat of honour. To his right were Mr. J. H. Balfour Browne, K.C., Mr. Dugald Clerk, Mr. Thomas Glover (President of the Institution of Gas Engineers), Mr. J. W. Helps (Senior Vice-President of the Institution), Professor Arthur Smithells, of the Leeds University, Mr. Norton H. Humphrys (President of the Southern Association), Mr. R. Bruce Anderson, Mr. F. W. Goodenough, Mr. Walter Dunn, and Mr. C. E. Brackenbury. To the left of the President were Mr. J. H. Redman, Mr. Alexander Wilson (Junior Vice-President of the Institution), Mr. S. Y. Shoubridge (Hon. Secretary of the Institution), Mr. T. Duxbury (President of the Manchester Institution), Mr. C. F. Ruggles (President of the Eastern Counties Association), Mr. Harold E. Copp (President of the Midland Association), Mr. Edward Allen, Mr. T. Acland (President of the Welsh Association), Mr. Herbert Lees (Secretary of the North of England Association), and Mr. W. Whatmough (Secretary of the Manchester Institution). Mr. Charles Clare, Mr. Fred. J. West, Mr. T. G. Marsh, Mr. J. W. Broadhead, and Mr. T. S. Clapham occupied the vice-chairs.

The customary loyal toasts were honoured.

MUNICIPAL APPROPRIATION OF ENTERPRISE.

Mr. BALFOUR BROWNE, K.C., proposed "The Society of British Gas Industries." He said he understood the British gas industries were the handmaidens of the great gas lighting industry, which was represented by his old friend Mr. Thomas Newbigging. Gas was not nowadays a commodity of luxury to the rich. It was essentially the poor man's illuminant; and it was not only in its modern developments a great and useful light, but, as they knew, it was an excellent and economical means of cooking, and the poor man could have his hearth and home brightened by the magic of the penny-in-the-slot meter. In its public aspects, gas had been an important factor in the advance of civilization. Anyone who thought of their streets before they were lighted, or when they were lighted with oil-lamps, which mocked the distant stars, and compared them with the streets of to-day, which were now bright avenues of light, would see what gas had done for the development of law and order, by making the thoroughfares as safe by night as they were by day. But the gas industry had not reached its present state of development without passing through various vicissitudes; and while gas had practically a monopoly, he was sorry to say it indulged in the stagnation of security. It was only when brought face to face with the active competition of the electric light that the great gas industries bestirred themselves and improved their methods. Since that time gas had steadily improved in public favour; and he was certain he was right in saying it had not been worsted by its dazzling rival. It was said at one time—

> A spaniel and a walnut tree,
> The more you beat 'em, the better they be.

He was quite certain, the struggle for existence that had been waged between gas and electricity as illuminants had been a decided advantage to the gas industry. He referred to this struggle for a purpose. The gas industry was like the god Janus. It had two faces. One face was that of municipal enterprise, and the other that of private enterprise. Perhaps he might be forgiven if he said a few words about these two faces. Municipalities were seldom pioneers. He thought this was eminently wise and right. Corporations had no right to speculate with the ratepayers' money; and when they did so speculate, they generally did it very ill. But it had been noted in the past that, whenever an undertaking became peculiarly prosperous, municipalities showed a strong tendency to appropriate that undertaking, and to oust from the acquired field the private enterprise that had pioneered it. It was a curious fact that, in the North and Midlands, where gas undertakings had been carried on under most favourable circumstances, owing to density of populations and nearness to coal, most of the enterprises were now in the hands of corporations. On the other hand, there were two counties in the South of England, in which there were 105 different companies existing to-day, and not in a single instance had the local authority got possession of the works, and what was more did not want them. It was worth considering for a brief instant whether these transfers were altogether in the public interest. While private enterprise was carrying on the gas-works, they had always the corporations watching, to see that the company did its duty by the public; but when the undertaking was in the hands of the corporation, then, to translate an old Latin proverb, "Who is to watch the watchers?" He had said that they did not find that corporations had been pioneers. He thought it was found that, when they got these undertakings into their hands—hands at the present time rather too full to do effective work—they lacked initiative, they lacked that inventive genius which was so important for carrying a great industry along the path of progress. He wished to quote a few words that fell from Sir Edward Chandos Leigh when he was giving evidence before the Select Committee on Municipal Trading. He said: "Municipalities never invented or initiated anything, either with regard to tramways, gas, or electric light; and yet, when a company had become flourishing, they had been rather forced into a corner to sell their undertaking." He (Mr. Balfour Browne) was not sure that these transfers had been in the public interest. There was another aspect which touched the trades with which the members of the Society were connected. That was, whenever they got a monopoly, as they had when a gas undertaking fell into the hands of a corporation, there was always a tendency to spread that monopoly over other things. Take railways for instance. Railways began by being carriers by rail. Look how they had spread their monopoly. They were now large town carriers, and were ousting to a large extent the Pickfords and the Baxendales who used to do a considerable amount of town carrying. Not content with this, they got hotels into their hands; they had become steamboat owners round the coast; and in this session of Parliament, Bills were being promoted to empower them to become carriers by motor car along their rails. This was the way monopoly spread; and it was the same with municipalities. In the time of dear coal, three or four municipalities applied to Parliament to be allowed to own and work coal mines. A large number of municipalities at the present time sold gas fittings, burners, governors, and the like; and in his view, it was only a short step from selling to manufacturing these and other things like retorts, purifiers, and so on, in which the members of the Society traded. Therefore, he thought the Society would do well to keep a sharp eye on the development of these municipal enterprises. He understood the Society did keep a sharp eye upon the Mines (Eight Hours) Bill, which, in his view, was founded on an economic fallacy. [There was laughter, with memory fresh as to certain passages in the President's address.] Proceeding, Mr. Balfour Browne said the President told him he had knocked that on the head. Perhaps he would knock him (the speaker) on the head for what he was about to say. In this municipal trading was the germ of Socialism; and if it was desired that all the means of production with which the members were connected should be handed over to a State monopoly, then by all means further it; but if they did not want to see a State monopoly of these things, then he said, for the sake of the great industries of which he had spoken, and with which the members were associated, "resist it with all your might." Goethe cried for "Light, more light." They wanted light in their houses, and they wanted light on their paths, which were beset by politics. He asked those present who were the custodians of this great industry to watch and ward it very carefully; for, if they did not, these advances of Socialism would wreck the industry, and, he believed, would mar, and produce the stagnation which was the detriment of, this country.

STANDARD CLAUSES FOR CONTRACTS.

The PRESIDENT, in reply, said, on his own behalf and that of the members, he thanked Mr. Balfour Browne for his lucid statement, in wise and kindly words, of the position of the Society. He agreed with everything he had spoken about, with the exception of the Mines (Eight Hours) Bill. He noticed Mr. Balfour Browne dropped that like a hot coal when he heard that he (the President) had anticipated him. But let that pass. He agreed with him entirely in his remarks with regard to the question of Socialism and the dangerous tendency of things as they exhibited themselves to-day. They thanked Mr. Balfour Browne for his good wishes that the Society might have a prosperous career of usefulness in the direction he had stated. The objects which the Society had in view, and which would be strictly pursued by the Council with the concurrence and assistance of the members, were good and desirable objects. These might be briefly summarized as first the meeting together in a spirit of *camaraderie* and good fellowship; and, second, the protection and promotion of the interests of its members in every just and reasonable way, while observing honourable practice in the conduct of business. These were objects the value of which could not be gainsaid. How they were to be accomplished was set out in the Society's rules. The very obvious truth that "Union is strength" had been acted upon from the very earliest times. They all remembered how Æsop with his bundle of sticks tried to impress it on the minds of those of his own day—600 years before the Christian era. Curious that the members of the Society had, until about three years ago, failed to take advantage of it. However, there was the other adage, which told them that "It is never too late to mend." And now that they had made such an auspicious entry into "Society," let them show by their deportment and practice that they were worthy of all esteem and consideration. Much of the success of the Society would depend on a wise Executive, bent on reconciling conflicting interests, and neither showing weak hesitancy nor a reckless transgressiveness in its business dealings. So far their prospects were of the brightest. They had been able to correct the idea that "Two of a trade could ne'er agree." They had shown that they could

not only agree, but that they could fraternize and meet together for mutual benefit and good-fellowship. If the Society had done no other than draw up the proposed standard clauses of contract, so skilfully drafted by Mr. Brackenbury, it had justified its existence. This was a work that needed doing both for the sake of its own members, and for the engineering profession generally. The clauses, he believed, would ensure uniformity in tendering, and fair dealing as between man and man. It was peculiarly satisfactory to them that this toast should have been proposed by their distinguished friend, Mr. Balfour Browne. He had been a power at the Parliamentary Bar and in gas legislation for very many years. With all his vast knowledge and experience of gas matters, technical as well as legal, he would shine as a gas engineer if the necessity arose. But he had other aspirations—aspirations in the direction of a seat in Parliament. He (the President) sincerely hoped that his ambitions might be gratified in that direction, though in such case they would lose one of the brightest ornaments of the Parliamentary Bar. And though some of them would probably not agree with the whole of his political programme, yet—and this was saying a very great deal—they would wish him as much success in the House as he had attained in the Lobbies. Even as regarded his political views, as was said of another very important personage indeed, "He'll may be take a thought and mend." He thanked Mr. Balfour Browne for the hearty manner in which he had proposed, and their friends had received, the toast of the Society.

The Spirit of Unity.

Mr. Thomas Marsh, in proposing the "Institution of Gas Engineers, and Kindred Associations," remarked that the Society were indebted to the Institution for two of their Presidents. They had lost the first of those Presidents. They regretted his loss; but his memory would always be with them. They were indebted now to the Institution for their new President, Mr. Thomas Newbigging; and he hoped they would have him with them for many years. He looked forward to extended work in the interests of the industry between the Institution, the District Associations, and the Society.

Mr. Thomas Glover, in the course of his reply for the Institution, said the toast had been given a prominent position in the list. He therefore took it the members of the Society felt that the Institution held some important place in relation to the Society; and that it was their wish that the Institution and the Society should draw closer together, and work in perfect harmony, for the future success of the industry in which they were all interested. As gas engineers, the members of the Institution did need the help of the members of the Society. How could they ignore it? He thought they had shown they had sympathy with each other in the model contract clauses completed that day; and he sincerely trusted that contractors for plant and apparatus would now be relieved of some of the unnecessary worries that had been entailed by the use of outrageous clauses in the past. When such clauses were proposed by inconsiderate engineers and those behind them, the contractors would now be able to say: "Here we have an alternative set of clauses that we suggest for your kind consideration; and we trust you may see your way to withdraw the clauses that you have hitherto worked to, and accept ours." These clauses would carry the more weight in that they had received the full consideration, and had been accepted by the Council of the Institution of Gas Engineers.

Mr. T. Duxbury, replying on behalf of "Kindred Associations," said the sympathies of the Associations had been all along with the Society and its objects. The admirable success of the Manchester Gas Exhibition was in large measure due to the Society and their President. The gas industry needed the co-operation of all who were engaged in it to fight the competitors of the day. One thing that had enlisted the sympathies of a large number of gas engineers in favour of the Society was the resolution of the members that there should be no violation by them of the Corrupt Practices Act. Adverting to the speech of Mr. Balfour Browne, he remarked that neither his colleague (Mr. Arthur Andrew) nor himself ever tired of urging that cheap gas was as important as low rates in a manufacturing centre like Oldham.

Mr. T. S. Clapham proposed "The Visitors." Referring to the model contract clauses, he observed that it had been a real education to go through them with the Council of the Institution.

The Endowment of a Livesey Professorship.

Professor Smithells said he believed he owed the honour of being called upon to reply to the toast to the fact that he had for some time past manifested an interest in the gas industry of the country. He had had the strongest desire to see established in some of the high places of learning in this country a curriculum of training for entry into the gas engineering profession which would put the industry in the same position as other branches of engineering. They could not fail to be struck with the gap that had existed with regard to the training of gas engineers. It required no great prescience to see what a great future lay before the gas industry; and it would not be disputed at this time of day that the gas industry must avail itself of the resources of science. The question was, How was this to be done? The opportunity had come sooner than he had dared to hope; and he need hardly say how proud he was that the University with which he was connected was to be the seat of the first serious attempt to provide instruction for those entering the gas profession. When he took up this project seriously, he went at once to the man who had always been known to him as occupying a unique position in the industry; and his interest was at once secured. One thing he said to him (Professor Smithells) was that he was surprised such provision for the education of young gas engineers had not been made long years ago. They all knew the decision that had been come to for the endowment of the Livesey Professorship at the Leeds University. He need not add anything to the eloquent advocacy they had that afternoon from the President of the Society; but he did feel that perhaps there was an opportunity of saying a word more in commending this project to sympathy and support. He never came among a body of practical men but that he yearned to see the promotion of that co-operation between men of science and men of industry which was so desirable for them both. He fancied that in this country, with its strong practical genius, and with its University traditions, there was often a very undesirable severance between industry and learning. His great hope was that in the new Universities which had been established in large manufacturing towns, they might bring about that union between the two that he thought to be so desirable. He hoped they would all believe that this new charge that was committed to them at the Leeds University would be carried out faithfully in accordance with the wishes of those who had entrusted it to them. But he also hoped they would not believe that at the University they could do more than was actually possible. They would be able to carry on the research, and they could impart accumulated knowledge; but he begged of those present not for one moment to suppose that they could do anything to replace practical experience. He did feel sure, however, if they had a fair opportunity, they could at Leeds do something for the gas industry, and a great deal. The bunsen burner and the incandescent mantle were the products of a University laboratory. The gas industry were making an investment, the return upon which would come, but not perhaps so soon as some might desire. No one who surveyed the history of science in relation to industry could doubt that the proper organization of a department of science in relation to the gas industry was bound to yield abundant fruit. When he asked for the support of those present, he was not asking for their pecuniary support mainly, but for their sympathy. Unless they had the real sympathy and interest of the gas industry, the new department could not possibly be a success.

Mr. J. H. Redman, who is a personal friend of Mr. Newbigging of some 45 years' standing, also replied.

Mr. Fred. J. West in proposing the toast of "The Press" spoke of the extent to which he found English gas literature read and studied on the Continent.

Mr. Dugald Clerk proposed the toast of "The President;" and, in his remarks, said he entirely sympathized with their lamented friend, Sir George Livesey, in his desire to assist the new Chair at Leeds University.

The President, in responding, said one of the highest honours and pleasures of his life was to stand well, and not only so but to deserve to stand well, with his *confrères* of the gas industry.

The speeches were interspersed by songs and humorous recitations. Happy indeed was the evening to all present.

THE ADVANCES OF GAS-LIGHTING.

The Lecture Room of the Society of Arts was brilliantly illuminated on Monday evening last week—at times by high-pressure gas-lamps, at times by self-intensifying ones, and at other times by ordinary inverted lights. These were to illustrate the second of the series of Cantor Lectures that are being delivered by Mr. Leon Gaster, on "Modern Methods of Illumination."

Mr. Gaster, in the first part of the lecture, dealt briefly with some of the points in the history of gas lighting, explaining how great were the difficulties encountered by pioneers in this country, and pointing out how the electrical profession, who had sufficient difficulties of their own to encounter, ought to be grateful for their efforts in overcoming early prejudices. He described next the original types of gas-burners of the flat-flame variety, succeeding with the regenerative, albo-carbon, and other methods of increasing efficiency. All these devices, however, he said, were relatively unimportant in comparison with the immense revolution accomplished by the incandescent mantle. In this connection a slide was exhibited showing the efficiencies of various types of gas-burners up to the most recent Keith lamp credited with 60 to 70 candle power per cubic foot.

The theory of the incandescent mantle was next briefly touched upon; and a slide was shown exhibiting some curves obtained by Böhm for the life of mantles in 1905. It was pointed out, how great was the need of the gas industry even to-day, for a really good mantle; for they had (so it was said) to be renewed, on the average, every 200 hours. Mr. Gaster explained, however, that laboratory life tests often bore little relation to practice, because of the absence of vibration, pressure fluctuation, and other causes. It had, indeed, been proposed that each consumer should have a governor placed in his house at the meter. A recent development was the Plaissetty soft mantle, a variety not only supposed to be more durable, but which had the important property of fitting itself to the shape of the flame.

The lecturer proceeded to point out that the design of the Bunsen burner was as important as the study of the incandescent mantle. The percentage of air and gas admitted to the burner was of vital importance. The early bunsen burner consumed about two of air to one of gas only; whereas ordinary town gas required about 5½ to 1 for complete combustion. To approach these conditions, special anti-lighting-back devices had to be adopted, such as the wire gauze acting on the principle of the Davy lamp. Another important development was introduced in the inverted burner, in which, however, several initial defects had to be overcome. For instance, the tendency to light-back seemed to be accentuated, the burners often made a hissing noise, and the flame was apt to discolour the lacquer of the burner. Many of these defects were overcome by suitably designed mixing chambers. There were on exhibition among others, some Bland burners equipped with a special anti-lighting-back device, and the Hands patent cooled burner, which, by the aid of special metallic wings, conducted away the heat. One interesting peculiarity of the inverted burner was that the condition of things after it had been burning for five minutes, and had heated up, was very different from those initially in evidence. This really necessitated re-adjusting the burner. To avoid this and other difficulties, and to secure permanently the conditions of most perfect combustion,

a special thermostatically controlled gas-burner had been introduced in the United States. One great advantage of the inverted burner was the fact that it shed a strong downward illumination. In street lighting, however, it was not desirable that most of the light should be thrown downwards; but, by altering the length of the mantle, the theoretically perfect curve of light distribution could be imitated.

The lecturer next proceeded to mention the very important development in gas lighting of the use of high-pressure gas. There was nothing peculiarly effective in the mere use of gas under pressure *per se*. It only served to mix the air and gas very thoroughly, and secured perfect combustion, and hence high flame temperature. As an illustration of the most recent progress in this direction, two Keith lamps, credited with a consumption of 60 to 70 candle power per cubic foot of gas, were exhibited, together with the actual compressor plant. The larger of these two lamps was identical with those newly installed in Fleet Street. Messrs. Smith's new Graetzin high-pressure lamps were also on view. As already explained, it was essential that the perfect conditions of combustion should be obtained by the use of compressed gas. In Germany, there had been a great deal of discussion as to the ralative merits of compressed gas and compressed air. On behalf of the latter system, it had been urged that it was unnecessary to alter the existing gas-pipes, but only to add those supplying compressed air; that under these conditions a leak would have less serious consequences; and, in addition, that it enabled the gas company to use the same type of meter as for a low-pressure system. Yet another method of securing efficient results was the Selas system, in which a mixture of gas and air in the proportions of two of gas to three of air was driven through the pipes, and utilized at the relatively low pressure of 10 inches in the burner. Seeing, therefore, that an increase in pressure meant, as a rule, altering the existing position of pipes, or laying additional ones, attempts had been made to introduce lamps which would burn with ordinary gas pressure, and yet would possess the advantages of the efficiency secured by compression. These lamps depended upon some self-contained pressure-raising device. For instance, Lucas some years ago devised a plan for adding a very long chimney to his lamp, and so secured a forced draught and the effect of high pressure. This method was simple and efficient, but rendered the lamps inconveniently long. More recently Lucas had devised a new method of obtaining these results—by the use of a thermopile, heated in the burner, which supplied current to a small electric motor mounted in the base of the lamp, and carrying a fan. This motor, revolving at about 2000 revolutions a minute, created the desired draught. Recently, an important improvement had been effected by arranging that the junction of the thermopile was not in actual contact with the flame; and it was claimed that thermopiles will run 1000 hours before needing renewal. This lamp was also exhibited. Another lamp on exhibition, also provided with a self-contained pressure-raising device, was the Chipperfield, in which a small hot-air engine was mounted above the burner, and automatically pumped air into a pre-heated chamber, from which it was subsequently fed to the flame.

The lecturer turned to one of the most important developments of recent date in gas lighting—namely, the question of control and ignition from a distance. This had been claimed to be one of the great advantages of electricity; but gas had not been slow to devise ingenious means of meeting present disadvantage in this respect. One system shown and demonstrated was the "Norwich" of Messrs. Hands and Co., according to which the increase in pressure following the turning of a cock (arranged to resemble very closely an electrical tumbler switch) caused the full supply of gas at a distant point to be supplied to the burner. Another system also exhibited on this occasion was the pneumatic one, which was described as simple in action, but was not, it was said, always equally effective for the lighting of lamps at a considerable distance away. Electrical ignition by means of a jump spark from an induction coil had also, the lecturer said, been employed, and was discussed in a recent paper by Mr. T. J. Litle, at the Second Annual Convention of the Illuminating Engineering Society. It seemed to be agreed in this discussion that failures had been very largely due to defects in insulation. The electrical ignition system of Messrs. Keith and Blackman was shown in operation for the first time in public. According to this method, the ignition is accomplished by a heated platinum wire in a mixing chamber. The lecturer remarked that the electrical ignition used in these lamps, and the electric motor driving the compressor, were instances of inter-communication between those representing gas and electricity which was now coming about, as long advocated by him.

Another direction in which automatic control at a distance was extremely desirable was for public street lighting. One of the advantages of electric lamps had always been the ease with which they could be extinguished and re-lighted from a central station. Recently, however, some devices had been invented by which a wave of pressure could be transmitted through the gas-pipes, and caused to turn on or off the gas at individual lamps. Two devices of this kind, using liquid floats and diaphragms respectively, were the "Rostin" and "Bamag" systems, both of which were exhibited in the course of the lecture. It was pointed out, however, that clockwork systems, while being very accurate, were, in a sense, too automatic. For instance, in the case of a fog, they naturally failed to take account of the changed conditions, while an apparatus of the former kind could be controlled from the gas-works. The particular kind of control suitable therefore depended on the nature of the district. It was, however, desirable that the lamps should be capable of being lighted by hand in an emergency.

The lecturer also mentioned a few of the attempts to create a perfectly self-lighting device; and some self-lighting mantles made by Messrs. J. Mayer and Co. were exhibited in action. In this case the mantle was provided with a pellet of spongy platinum and other materials which became heated when subjected to the flow of gas, and so eventually caused ignition. It was claimed that the self-lighting properties of the mantles on exhibition would last as long as the mantles themselves.

A few words were next said on the subject of street lighting; reference being made to the lighting by high-pressure inverted mantles in London and Berlin. A new method of attaching the lamps to the houses, instead of at the top of lamp-posts in the customary manner, had been adopted in Fleet Street. At the same time it was interesting to observe that the system of stringing electrical arc lamps on wires spanning the street had been employed in Cannon Street. This method had previously been used in the Friedrichstrasse in Berlin.

The lecturer dealt in passing with a few general questions of interest at the present moment, notably the problem of whether it was desirable or possible to replace our present method of testing gas for illuminating value, by a calorific test. It was pointed out that the granting of permission to London Gas Companies to reduce their candle power from 16 to 14, and to the Edinburgh and Leith Gas Commissioners to reduce their candle power from 20 to 14, were illustrations of the prevalent tendency.

Some reference was also made to the attitude of gas companies towards consumers, which had undergone a marked modification in recent years. It was now realized that the companies ought to do all that was possible to help their customers; and some of the London Gas Companies undertook the supervision of their installations at a small fee. For instance, the Gaslight and Coke Company adjusted the burners of a large number of consumers, and renewed as many as 200,000 mantles in the course of the year. Customers, however, frequently learnt sufficient of the art of making their own adjustments to lead them to eventually decide to do without the Company's assistance. In this way, the Company did invaluable educational work. Their action in selecting and testing the type of burners supplied to consumers by a rigid specification was also an important development of their operations.

In referring to the great progress that had recently taken place in the gas industry, the lecturer alluded to the loss the industry sustained towards the end of last year in the passing away of Sir George Livesey, and expressed his warm approval of the method adopted of honouring his memory by creating a special professorship at Leeds University. He hoped that these facilities would be taken advantage of by the young members of the profession, and that manufacturers would recognize the duty of encouraging, by suitable means, students who had taken the pains to educate themselves in this way.

The Institution of Municipal Engineers are arranging to hold a general meeting at Olympia on April 24, on the occasion of the International Building Trades Exhibition, and another general meeting at Durham during the month of June.

According to the specification of a French patent taken out by M. Kaysser, of which an abstract appears in the "Journal of the Society of Chemical Industry," permanganate of potash, either alone or mixed with cement, added to the water which forms the hydraulic seal of gasholders, will convert the cyanogen compounds into bodies which have no deleterious action on the iron.

In consequence of the death of Mr. Wilson Fox, the President of the Board of Trade has appointed Mr. G. R. Askwith, K.C., who is now Assistant-Secretary (Railway Department), and had been designated as Sir C. N. Dalton's successor at the Patent Office, to be Comptroller-General of the Commercial, Labour, and Statistical Departments. Mr. W. F. Marwood, the Principal Clerk in the Railway Department, will succeed Mr. Askwith as Assistant-Secretary. The President has also appointed Mr. W. Temple Franks to be Comptroller-General of Patents, Trade Marks, and Designs on the approaching retirement of Sir C. N. Dalton.

An interesting feature of the recent annual meeting of the Harrogate Gas-Works Sick Society was the recognition of the services rendered by Mr. Jackman as Hon. Secretary during a period of ten years, by the presentation to him of a marble timepiece. This was done, at the request of Mr. Hefferman, the oldest servant of the Company and member of the Society, by the Hon. Treasurer, Mr. G. S. Sayner, the Engineer, who, on behalf of the members, expressed their warm appreciation of Mr. Jackman's labours in bringing the Society through various vicissitudes to a state of prosperity. He said it was their unanimous wish that he should have some tangible token of this appreciation. Mr. Jackman, in acknowledging the gift, said he should value it especially for the good feeling which had prompted it—a feeling which he hoped would always exist, both in the Society and in the works generally. He could assure the donors that it would be one of his most cherished possessions. Mr. Sayner expressed the hearty support of the movement by Mr. Wilkinson, the Secretary and General Manager, who was unavoidably absent.

THE MAKE AND SALE OF COKE.

By Robert Watson, of Doncaster.

[A **Paper read before the Manchester District Institution of Gas Engineers, Feb. 27.**]

It is now seven years since Mr. Whatmough usefully brought the question of coke disposal before this Institution. Following the discussion on his paper, the Lancashire and Yorkshire Commercial Sections were established; and at the various meetings of these bodies the subject has again and again been under consideration—the mere mention of coke being ever provocative of debate. A few changes have occurred since 1902 in the conditions of coke usage; and it is perhaps now opportune to bring the matter once more before the major Institution, to afford members generally an opportunity of interchanging views on the present position of the market and the possibility of obtaining fresh outlets and better prices.

The importance of the subject, and particularly of the monetary aspect, becomes obvious when it is remembered that the price of the prime product of our industry is very largely affected by the amount realized for coke as the chief residual. The relative value of the several bye-products in the manufacture of gas may best be judged by the following figures, based on "Field's Analyses" of Provincial Gas Corporations and Companies, and taken in quinquennial periods from 1887:—

Amount Realized from Residuals per 1000 *Cubic Feet of Gas Sold.*

Year.	Total per 1000 Cubic Feet.	Coke and Breeze.		Tar.		Ammonia.		Cost of Coal per 1000 Cubic Feet.
	d.	d.	Per Cent.	d.	Per Cent.	d.	Per Cent.	d.
1887 .	5·7	2·8	49·0	1·2	21·1	1·7	29·9	13·2
1892 .	7·6	3·9	51·4	2·0	26·3	1·7	22·3	16·4
1897 .	6·0	3·1	51·7	1·7	28·3	1·2	20·0	12·8
1902 .	8·0	4·7	58·7	1·4	17·5	1·9	23·8	15·6
1907 .	8·3	5·0	60·3	1·4	16·8	1·9	22·9	13·2

These figures indicate the increasingly dominant influence of coke prices upon manufacturing costs. They also suggest the benefit to be derived from a good monetary return per unit of coke, and the advantage of an increased output of the residual per ton of coal carbonized. The latter fact is so well recognized by some in authority, that high figures for coke are as much looked for as high yields of gas, although it does not follow that a large sale per ton of coal is always compatible with the true interests and economy of the working. The quantity of coke actually sold is obviously affected by the character of the coal, the method of carbonization, and the varied usage of steam for exhausting, pumping, sulphate making, and, in some cases, stoking and conveying purposes. These factors differ so much that comparison between undertaking and undertaking is difficult, and, in the absence of full particulars, unfair. Looking through "Field's Analyses" for 1907, it will be seen that the average make and sale of coke per ton of coal are given as under:—

		Coke Made.	For Sale.	Used for Fuel.
London companies	cwt. . .	12·43	9·43	3·00
Suburban companies	,, . .	12·27	9·68	2·59
Provincial corporations	,, . .	12·90	9·49	3·41
Provincial companies	,, . .	12·17	9·18	2·99
Average	,, . .	12·44	9·44	3·00

There are coals which yield more than 12·44 cwt. of coke per ton—the weight being obtained under the same conditions and at the same average temperature as the coal; and this fact would account for the higher sales shown by some gas undertakings. It is a question, however, whether the figure quoted can be exceeded by much more than 1 to 1½ cwt. By process of subtraction, an approximate indication of the highest quantity possible may perhaps be obtained. Assuming a coal with yields of 11,000 cubic feet of gas, 11 gallons of tar, 16 to 18 gallons of virgin ammoniacal liquor, a weight of some 690 lbs. is accounted for per 2240 lbs. of coal. The balance for coke is about 1550 lbs., or 13·8 cwt. It is true that the weight may be increased by atmospheric and other moisture, but against this gain, taking the year round, can be set unconsidered items due to wet coal, shortage, and similar losses. A deduction of 3 cwt. for works' fuel speedily reduces the available coke and breeze to the region of 10¾ cwt. per ton of coal carbonized. This, of course, excludes pan breeze. An actual sale of anything more can, in the majority of cases, scarcely be hoped for, unless, to the exclusion of steam plant, gas engines or electric motors are adopted for all motive purposes. The advantage or otherwise of the latter course is a matter for the undertaking concerned. The quantity of coke and breeze sold may indeed be less, and profitably so, if by the use of steam for stoking and other machinery, low-priced breeze can be taken off the market and employed as boiler fuel.

Turning to the larger question, the total quantity of gas coke for disposal may at the most be based on an average of 10 cwt. of coke per ton of coal. The coal carbonized in the United Kingdom during the year 1907 amounted, according to the Board of Trade returns, to 14,846,260 tons, and the coke placed on the market would therefore be about 7,423,000 tons. Of this, water gas manufacture absorbed (say) 450,000 tons; leaving a balance of some 6,950,000 tons for sale. But for the use of water gas, carbonization would have required some 16,688,000 tons of coal, and yielded 8,344,000 tons of coke. Manufacturers of water gas have therefore relieved the situation to the extent of 1,400,000 tons per annum.

It would probably be thought that the gradual adoption of water-gas plants would at least have coped with the increased gas required, and tended to decrease the quantity of coke. As a matter of fact, comparing the years 1900 and 1907 of the present decade only, there was in the last-named year an increased usage of 940,000 tons of coal, yielding (say) 470,000 tons of coke; and of this not more than 177,000 tons would be absorbed by the extra water gas manufactured. So far as the gas-making methods of companies and corporations respectively are concerned, the Board of Trade returns disclose the fact that the former, by the adoption of water gas as an auxiliary, do the greater share in relieving the coke market. This may be due to geographical conditions; the majority of important companies being south, and outside the coal areas. It is interesting to note, however, that during the year 1907 the sale of gas under company administration amounted to 33,920 cubic feet per consumer; and of this, 4420 cubic feet, or 13 per cent., consisted of carburetted water gas. On the other hand, the gas taken by the corporation customer came to 25,200 cubic feet, of which 1930 cubic feet, or 7½ per cent. only, was carburetted water gas. Going back to the beginning of the decade, 1900, the corresponding figures were respectively 41,700 cubic feet, of which 3980 cubic feet, or 9½ per cent. was carburetted water gas, and 28,000 cubic feet, with 1550 cubic feet, or 5½ per cent., of carburetted water gas.

A like water gas percentage of 13 in the case of the corporation undertakings would, during the year 1907, have relieved the market to the further extent of 246,000 tons, and practically absorbed the whole of the extra coke due to the increased usage of gas. As the matter stands now, the gas industry of the United Kingdom has some 7 million tons of coke to be disposed of each year. The actual quantity tends to increase with the growing demand for gas, and renders the search for new custom the more necessary. The difficulty of disposal varies with the condition of trade and the ruling prices, not only of competing coal, but also, in some districts, of oven coke. For obvious reasons, "Coalite" is not regarded as a competitor. There are times when the factors named bring about sluggish sales and increased stocks. A consideration of the various fields for the use of gas coke, however, scarcely warrants feelings of depression. As will be presently indicated, outlets can probably be found in the home districts for any increased quantity of coke, although the situation is a curious one, inasmuch as while one department of the gas undertaking may be urging the use of coke for domestic fires, another is doing its best to abolish them in favour of gas fires and cookers. Fortunately, there is room for both.

Probably one of the most important markets for gas coke offered by a single industry is that connected with the manufacture of portland cement. It is true that the prices obtained are such as to cause gas undertakings to look upon this market as one for surplus coke only; for where any appreciable quantity has to be so sold, the financial effect is distinctly felt at the end of the year. Some altruistic sympathy must nevertheless be permitted when it is remembered that the cost of the fuel, even at what gas managers consider low prices, runs into the region of 20 per cent. of the prime cost of the cement. It is difficult to say whether the quantity of coke used by the manufacturers is decreasing or not. There has been undoubtedly considerable growth in the production of English cement as a result of its extending use in constructional work, both at home and abroad. The exports alone have distinctly increased in recent years, and amount to about 750,000 tons; while imports are at the present time rapidly diminishing in quantity.

Against the larger production of cement must be reckoned, so far as coke interests are concerned, the change in the methods of production. As is well known, the rotary kiln, with the use of powdered coal, has of late years been displacing the chamber or stationary kiln and its coke fuel. The displacement process is obviously a gradual one, since the adoption of the rotary kiln means a considerable monetary outlay. At the present time it is estimated that about one-third of the portland cement manufactured is produced by rotary kilns. Since there is an annual output of somewhat over 3 million tons, it would follow that coke is now employed in the production of (say) 2 million tons. These figures have been obtained from an authoritative source, and were kindly supplied in response to the writer's inquiry. The still existing chamber method, with a coke fuel consumption of 8 cwt. per ton of cement, would appear therefore to account for an absorption of 800,000 tons of gas coke per annum. This computation does not, of course, cover any coke used in the somewhat cognate business of lime-burning; and the total for the calcareous industries may be well over the figure quoted.

The malting industry was in some districts a useful help to local sales until the arsenic scare led maltsters to bar any and every thing, including fuel, which contained an appreciable fraction of this element. Gas coke as a fuel consequently suffered for some time thereafter. The total quantity used throughout the country could not, however, have exceeded 250,000 tons per annum—assuming that this fuel was exclusively employed, and that 80 lbs. of coke were required per quarter of malt. The fuel

employed, however, was frequently a mixture of gas coke and oven coke, or gas coke and anthracite. To-day, conditions of usage vary. While in the London district maltsters, at the instance of the brewers, have to make "assurance doubly sure" by the exclusive use of anthracite for the drying and curing of malt, others elsewhere are probably getting quite as certain results by employing anthracite for the first part of the drying process—until, in fact, the malt has lost its spongy or absorbent condition—and gas coke for all the subsequent stages. In many kilns a filter of limestone is employed; and this not merely efficiently arrests the arsenious oxide fumes, but, to the advantage of the maltster, reduces the fuel account. As a matter of fact, analyses of malt show that gas coke under these conditions may be used with satisfaction and safety. If further precaution is desired, the patented salting process during carbonization is said to yield a coke of which no maltster need be afraid. There is therefore in this industry still a fair market for gas coke in view both of its comparatively low price and heating value; but it should be borne constantly in mind that maltsters experience less difficulty in its all-round use if the coke supplied to them is clean and thoroughly carbonized.

If the coke trade shows signs of diminution in these two industries, there appears to be an opening for a new market elsewhere. This may be at present of uncertain dimensions; but because of its purely local character, the custom will be worth cultivating, and is likely to be more remunerative than is the case with coke which is sent out of the district.

The writer has been one of those who felt that suction gas would not in the long run prove formidable, assuming town gas to be procurable at a reasonable and not necessarily cut-rate price. And the belief has, in many cases, been justified by experience. As a matter of fact, the competition, except in certain instances, is not so much between suction and town gas as between either of these and electricity or steam. It remains to be seen which in the race will occupy the best place; but for ordinary engine purposes, town gas is still likely to keep a strong position. Mr. P. W. Robson, of the National Gas-Engine Company, estimated that, so far as the power demand of British manufacturers was concerned, some 80 per cent. was under 300 B.H.P. In the whole of the power field thus suggested, there are future possibilities for gas in some form; and where small steam units or electric plants are displaced either by town or suction gas, one or other of two branches of our undertakings may hope to reap. The interesting point for coke suppliers is the fact that where suction-gas plants are installed, the owners, on their own account as well as by the advice of the makers, are becoming users of coke in place of anthracite. It is believed that already a considerable quantity of coke, alone or mixed with anthracite, is being employed in this way, despite the fact that the plants were designed for the last-named fuel. Later producers have been constructed with grate areas suitable for coke, and the number of these is increasing from year to year.

In reply to the writer's inquiry, the principal suction-gas plant makers state that the demand for coke-operated producers was considerable during 1908, and in one case, among the others, amounted to two-thirds of the total number sold. Two of the chief firms between them turned out during the past twelve months coke-operated plants equivalent to 10,000 B.H.P.; and these alone would account for 20,000 tons of coke annually. It is true that these plants were for foreign as well as home customers; but the output of producers by (say) a dozen firms over a short course of years should, in our own country, be of considerable service to gas undertakings who may have difficulty in finding a market for their surplus coke. An instance of what is being done is afforded by one firm, who say they have in South London a 250 B.H.P. vertical engine and gas plant designed to run continuously, and working satisfactorily day and night on gas coke.

In view of the high price of screened anthracite nuts and peas, and, in other than colliery districts, of small oven coke, which is also in the field as a competitor, gas coke should rise in further favour with suction-gas users. It must be remembered, however, that the coke, as in the malting trade, must be well carbonized to eliminate tar, otherwise operating troubles arise. It must also be clean and screened. So far as the latter is concerned, Messrs. Crossley Bros. suggest in their letter that the coke might well be graded by the same mesh screens as are used in anthracite coal washings.

The principal and most important market for the disposal of coke is, of course, the gas undertakings' own district; and here the extent of the business primarily depends upon the nature of the staple industries and the class of residents. The possibilities of local custom may best be judged by a comparison of the coke trade done by various undertakings in the district of this Institution. By the courtesy of the members of the Lancashire and Yorkshire Commercial Sections, which the writer warmly acknowledges, data have been obtained showing to what extent local sales are encouraged by the breaking and bagging of coke, and the effect upon the quantity sold outside the home area. Some fifty replies have been received from members in response to circularized queries; and as the total quantity of coke dealt with is over 800,000 tons, they can perhaps be taken to be representative of coke sales up and down the country.

The replies have been classified, and the figures tabulated and totalled as follows:

Class A consists of 17 works which undertake the breaking and other preparation of coke for special sale.

Class B comprises eleven works where there seems to be no special reason for so doing, since the whole of the large coke—about 26,000 tons—is taken up locally.

Class C covers 22 undertakings, which do not appear to have taken any steps to develop the broken-coke trade.

The acknowledged large undertakings, of which there are several in the two counties, have been dealt with separately, because their figures may easily and unfairly affect the average of the majority. It may be said at once that the aggregate figures of Classes A and C suggest the broad fact that, where broken or otherwise specially prepared coke is put on to the local market, the sales outside the district tend to decrease in quantity. For instance, Class A sell 14¼ per cent. of their coke broken or otherwise graded, and their outside sales amount to 10 per cent. Class C, on the contrary, sell no broken coke, and 28 per cent. of the sales take place to outside customers. It may be taken that the greater part of the broken coke trade is due to new customers; and this is borne out by figures of comparison for the years 1903 and 1908. In contrasting the actual figures, note must be taken of the ordinary expansion of business with which gas undertakings are usually blessed. As compared with 1903, the increase in the amount of coke for last year, so far as Class A was concerned, was roughly 8300 tons, and a market had, of course, to be found for this quantity. In consequence of the development of the home trade, the sales of broken or otherwise specially prepared coke increased by 7200 tons, and the outside sales decreased by 4700 tons. These results are the more remarkable since half the undertakings included were already selling broken coke in 1903, although to a smaller extent.

The contrast in Class C is rather marked. Here the aggregate quantity is some 50 per cent. greater than that of Class A, and the increase in the quantity of coke placed on the market during the past year, as compared with 1903, was 10,500 tons. No broken coke was sold in either year; and fact stands reflected by the outside sales, which rose by 3300 tons. Data of only four of the large undertakings have been procurable, and the number is too small to warrant representative figures, particularly as the very magnitude of the cities concerned probably depends upon special industries, which may or may not require coke for their work. Within limits, however, the influence of the broken coke trade is still felt. Two of the undertakings are cultivating this custom; one having started within the years of comparison. Their aggregate increase in coke output amounted during 1908, as compared with 1903, to 26,200 tons—the broken coke sales rose by 22,700 and the outside business by only 3700 tons. A third seems to have sold the whole of the coke locally, with but partial assistance from broken coke. The fourth, however, being without this aid, appears to have found relief by selling outside the home area about a third (15,000 tons) of the increased quantity of coke disposable.

Taking those districts, large and small, where local trade has been systematically encouraged by the supply of broken coke, screened breeze, &c., since the year 1903, some very gratifying results are disclosed. These undertakings, ten in number, have an increase in their aggregate sales of 21,100 tons as between 1903 and 1908. In the first-named year, they sold no broken coke, and dispatched 26,600 tons of coke out of their own areas. Last year, they disposed of 20,100 tons of broken coke, and reduced the outside sales to 21,500 tons. That is to say, the whole of the increased quantity, and part of what was previously sent out of the district was sold in the home area.

The percentage of broken coke supplied by Class A is by no means a realizable maximum. Some of the undertakings have only lately started, others have had but a year or two of work in this direction. It is interesting to note that in several cases as much as 20 to 24 per cent. of the total sales have been effected with broken or similarly prepared coke. Outside sales are not to be deprecated, since coke is required for certain industries in quantities too large for the local gas-works to supply; but the figures given indicate that gas undertakings as a whole can materially influence both the coke trade and prices by the cultivation of their local trade.

An analysis of custom in towns where broken coke is supplied seems to suggest that outside sales, on the average, need never reach 28 per cent. as in Class C. As data for one's own town are necessarily more easily procurable, no apology is offered for submitting Doncaster figures as indicating the general uses to which coke is put.

	Per Cent.
(*a*) General custom—houses, churches, greenhouses, and small credit and cash sales	59·9
(*b*) Bakers and confectioners, &c.	7·1
(*c*) Small industries (building, malting, &c.)	9·4
(*d*) Engineering works	23·6
	100·0

The first three classes of customers include ordinary customers such as may be found in any town. The last class covers all firms whose works need not necessarily be in Doncaster. The percentage shown, however, must not, for purposes of comparison, be taken to represent what would be under other circumstances outside sales, since most towns have some industry, large or small, within their borders. No coke has been sold outside the district since the supply of broken coke was undertaken three years ago. Prior to that time, some 10 per cent. of the coke was sold to cement manufacturers. The custom for broken coke and smith's breeze is already 13⅓ per cent. and there is every prospect of

further growth. Methods of advertising and developing local trade by breaking and bagging coke will occur readily enough; and it is the writer's intention to leave this to be indicated by members who would prefer to give their views and experience. One good way of starting the system, in addition to ordinary methods of advertisement, was that adopted by Mr. J. H. Brearley, at Longwood. This consisted of the free distribution, with necessary particulars, to all householders of 6 to 8 lb. samples of the broken coke which the Longwood Gas Company were prepared to supply. These free gifts seem to have been amply justified by the resulting trade.

An important example of what can be done in thickly populated districts is furnished by the Gaslight and Coke Company. This method covers the sale of coke in as small a quantity as 28 lbs. The coke is delivered in paper bags from vans, hawking from door to door and calling upon regular customers. The system was primarily introduced by Mr. Corbet Woodall for the convenience of residents in West End flats, where the lifting of bulk is attended by inconvenience. The writer is indebted to Mr. Woodall for the information that this class of business has attained considerable success among the poor people living in the North and East of London. In the case of the Tottenham Company, of which that gentleman is Chairman, some striking results have been achieved by three months' work only; and as to this, one cannot do better than quote from a letter received from Mr. A. E. Broadberry, the Engineer:—

Our method of introducing the business was to send a canvasser to oil and colour shops, greengrocers, and similar small tradesmen, of which we have hundreds in our district, to induce them to take up the sale of the bags. We deliver to them in lots of not less than one dozen bags at 3s. 6d. per dozen, and they retail them at 4½d. each. We ourselves also sell them at the works and our different offices at 4½d. per bag. The intention was to find a better outlet for the small coke coming from the screens at the head of the hot-coke conveyor; but I found that this coke was too wet to deal with in paper bags—the moisture from the coke making the bags very damp, in which condition the paper loses all its strength. It therefore becomes necessary to introduce some system of drying this coke before it is available for this particular trade. With all the waste heat of the gas-works this should not be difficult. . . . The trade has been growing all the time, and we now receive orders every day for about 30 dozen bags, equalling 4 tons 10 cwt. per diem; and I fully anticipate that next winter the quantity will be more than double. I have been quite surprised at the huge demand which is growing up, and shall have to put in some special arrangements for dealing with it, as at present the orders come faster than we can do with them. I believe that other suburban companies intend to take up the business, and feel sure that if it becomes general over London that a lot of coal will be displaced by coke fuel, and that the atmosphere of London will be thereby rendered far cleaner than it has hitherto been.

Mr. Broadberry sends a sample of the bag he has in use, and the makers state that the cost per thousand, printed, is 43s. 6d., less 2½ per cent.

A method of small sales such as indicated would appear to offer distinct advantages in towns of any size. But whether in 28 lb., 1 cwt., or larger quantities, there is evidently a fair local outlet for coke, and it is difficult to see why the success of small gas sales, as exemplified by slot-meter custom, should not be followed by like success in small coke sales. It has been previously pointed out that the total output of coke in each town does not amount to more than 20 cwt. per house per annum; and, since a considerable quantity is required for ordinary trade purposes, the problem of the disposal of the balance does not, on the face of it, seem to be a serious one.

Appendix Showing Aggregate Sales.

—	1908.			1903.		
	Total.	Broken, Etc.	Outside.	Total.	Broken, Etc.	Outside.
Class A	107,067	15,296 14·25 p.c.	10,554 10 p.c.	98,731	8,085 8·2 p.c.	15,238 15·5 p.c.
,, B	26,612			20,449		
,, C	159,000		45,300 28·5 p.c.	147,465		42,004 28·5 p.c.
Class A and two large undertakings together . .	328,515	41,460 12·6 p.c.	57,780 17·6 p.c.	294,016	11,565 3·9 p.c.	58,770 20 p.c.
Six undertakings, large and small, making water gas	310,788	12,888*	30,560 9·8 p.c.†	255,629	11,597	5,000 2 p.c.

* The small works only supply broken coke. † Increase due in part to decreased supply of water gas.

Discussion.

The PRESIDENT said the figures given by Mr. Watson spoke for themselves. But he would like to emphasize one point; and that was that they should see that the coke was broken up to a suitable size for burning. They could get a really good fire from coke if properly burnt; and it must not be forgotten that coke was a very important residual. If coke was at a low price, they had to look to some other quarter for making up the revenue.

Mr. J. G. NEWBIGGING (Manchester) said they were indebted to Mr. Watson for bringing this matter before them that day. The author had said all that could be said in advocacy of their getting an increased revenue from this residual, which played such an important part in reducing the manufacturing cost of their main product—gas. But to compare one undertaking with another, as Mr. Watson had done, was hardly necessary. To his (Mr. Newbigging's) mind, it could not be done by pence. A better comparison would be to ascertain, as far as possible, from the figures given what was the revenue per ton of coke sold. Let them take the case of Manchester—and he might be excused for speaking of Manchester, because they had been rather severely criticized. It had been stated that Manchester did not make the best use of their production of coke, and therefore did not get as large a revenue as other undertakings did from its sale. He would consequently like to put before the members some facts. He had made a comparison with Sheffield and with Widnes; and he did not think he could have made a more severe comparison than these two places, because, according to the last two returns, the residuals paid for the coal within 1·9d. per thousand cubic feet; and in the case of Sheffield, they seemed to have paid for the coal with a balance of nearly 2d. He found that their average price for the year ending March, 1908, was 8s. 11·58d. per ton of coke sold. Widnes got 9s. 3·52d. (something like 5d. higher than Manchester), and Sheffield 10s. 3·36d.—that was for 1907, he believed. He thought Mr. Morrison would admit that he had a very great advantage with regard to the sale of coke locally. There were many industries in Sheffield where broken coke was essential. The same could not be said of Manchester. They had very few industries near where broken coke was required. Then, in making comparisons between large works and small ones, it should be remembered that corporation engineers had not the same free hand in the disposal of coke as company engineers had. For example, corporation committees would not barter in the selling of coke in a way to enhance the price to the ratepayers, in order to obtain about the average return. The tendency was rather to give local people the advantage. He was not there to support this theory. He believed they should make as much as possible out of their residuals. But this fact ought to be remembered in making comparisons between one undertaking and another, especially between companies and corporations. There was another point he would like to make. It should not be forgotten that with large undertakings they were at a much greater disadvantage as compared with smaller ones in the sale of coke. Small undertakings were generally situated nearer to the best class of customers—that was, the market gardeners, owners of hot-houses and conservatories—whereas the larger undertakings were situated in or near large cities, where there was not the same consumption to be obtained. It should also be remembered that large manufacturing concerns of every description were turning to electrical power. Therefore, there was not the same outlet for coke in such centres. And even where steam power was used, they burned slack in preference to coke, unless it could be obtained at a very low figure indeed. He was glad Mr. Watson had laid stress on the advantage of supplying broken coke. He believed it was in this direction that they must look for an improvement in the revenue from coke, especially if distributed in small quantities.

Mr. J. H. BREARLEY (Longwood) said that the paper given by Mr. Watson stamped him as a keen student of gas economics; and his close observation and experience of the subject made the information given doubly valuable. He had listened with great interest to what Mr. Newbigging had said. He would not like the discussion, however, to take the form of what the average receipts were from coke, but rather that it should be on the lines as to what they were going to do in the future to secure a better return for the coke produced. In his own case, their average receipts were very small, including breeze. Having regard to labour, &c., the amount would be 10s. 1d. or 10s. 2d. He should dissent strongly to the statement that in small places they had a great advantage over the larger ones in the sale of coke. In his case, they had about 5000 householders; and the annual output of coke was 5000 to 6000 tons—giving an average of 22 or 23 cwt. per householder per annum. In spite of the fact that gas had displaced coal to a great extent in the summer months for cooking, they knew that householders on the average used a great deal more smoky fuel than these figures represented. He thought in every one of their areas they had ample scope to increase the consumption of coke. He felt sure they could sell every ounce of coke which they produced; and he did not think that he needed to enlarge upon this point. They heard a good deal about smoky atmosphere and the purifying of the air. They were in rather a unique position in the fact of having two commodities—gas and coke—which seemed to be useful things in the solution of this problem. They had heard a good deal about "Coalite;" but he had never been able to understand why gas men should be so frantically opposed to its introduction. Nor could he quite see why there should be such objection to suction-gas plants. It seemed to him that the more gaseous fuel that was used, the better it would ultimately be for the gas industry. It was no use their kicking against the pricks; for if these introductions were cheaper, they were bound to succeed. What they had to direct their attention to was the cheapening of their product and making the best use of all their residuals. He thought the future of coke depended upon the means taken to break it up and make it more suitable for consumption. At the same time, he did not think their enthusiasm would carry them to the same extent as had been done by southern undertakings, who supplied coke in small bags. This served the purpose very well in flats; but the cost of making the coke up in such small quantities must not be lost sight of. He was quite sure from the

figures laid before the Commercial Section, and before them that day by Mr. Watson, that they could sell all their coke locally if they tried.

Mr. S. E. Halliwell (Littleborough) desired to express his appreciation of Mr. Watson's paper; for he considered the time most opportune for a discussion on the question of coke sales. Since he became actively connected with the work of the Commercial Section, he had realized more fully the importance of the development of local sales, both by discussion at the monthly meetings and by the tabulation of members' returns bearing on the subject. There was plenty of evidence that, since the reading of Mr. Whatmough's paper in 1902, the necessity of creating a better local demand was being more recognized by gas managers; and he did not think that he was claiming too much in saying that their Commercial Sections had done good service in this direction. In a return issued by the Lancashire Section about twelve months ago, it was shown that, out of 42 towns, only nine sold the whole of their output locally; while the remaining 33 towns reported outside sales varying from 2 to 64 per cent. of the total output. Out of the total of 513,000 tons sold, 158,000 tons were disposed of outside the area of supply—these figures representing an average of 30 per cent. So that there was evidently plenty of scope for enterprise on their part, especially taking into consideration the increasing quantity produced each year, despite the extended use of water gas. He lately noticed that the Deputy-Chairman of the Croydon Gas Company commented on the matter, at their half-yearly meeting, and expressed the opinion that if the economy and advantages of coke for domestic uses were better known among householders, a largely-increased proportion of the make would be sold locally. They encouraged and cultivated an extended use of gas for all purposes which often, years ago, would have been considered out of the ordinary. They did all in their power to educate consumers in the use of gas appliances; and he considered it of importance, from a revenue-producing standpoint, to educate consumers to the economical uses of coke for domestic purposes, in order to overcome the rooted prejudice which appeared to exist among a certain class. The method of doing this would largely depend upon the requirements of each district, and also, of course, upon the quantity available above the ordinary demand. But much could be done by practical demonstration in office and show-room, by the distribution of free samples, as adopted at Longwood, or by the sale of small quantities as described in the paper and adopted by the Gaslight and Coke and Tottenham Companies. The ancient method of take it or leave it style was not suited to present conditions; and the system of offering coke in quantities and quality suited to district requirements was bound to be successful. To attain the realizable maximum of local sales would mean increased revenue to their departments; and what would then be the diminishing quantity known as surplus stocks could be placed without unnecessary competition, as at present, at fair market values, the advantage of which would go to the gas consumer or ratepayer, according to the enlightenment of the authority. Much could also be done by collective effort. At the risk of being accused of taunting—but he could only plead enthusiasm in a good cause—he should like to say that it was his candid opinion that the Commercial Sections could do much to simplify the position by regular discussion and by the issue of statistical information to the members, showing the progress of and the methods adopted to create, new business, with its consequent lessening of surplus quantities and increase of realized average price per ton.

Mr. H. Townsend (Wakefield) said he had for some years been acting on the advice contained in Mr. Watson's paper, with the result that they had had to extend and alter their plant. He explained how this had been accomplished; and passing on to deal with the cost of putting up the coke in small bags, he said that in some cases the expenditure would make it prohibitive. But, of course, the cost depended a great deal on the way they dealt with the matter. He agreed with what had been said about breaking up the coke to a suitable size for consumers; and he hoped during the coming winter to do something more in this direction.

Mr. E. Allen (Liverpool) had been interested in the statements made about the sale of coke, because his Company were affected by gas undertakings in the vicinity which, being unable to dispose of all their coke locally, sent the surplus to Liverpool. At present there were a number of towns in Lancashire that did this. No doubt many of them would now realize that their methods in the past had not been satisfactory, and resolve to mend. In Liverpool, they had not much difficulty in disposing of their coke, as a good deal of it was sent away by ship. He was satisfied that, as a result of the discussion of the subject, a larger percentage of the coke made would be disposed of locally, to the advantage of the respective undertakings.

Mr. J. H. Hill (York) stated that he supplied coke to consumers in bags; the charge being 5d. per bag delivered. In this way, they sold about 50 tons per week all through the winter. They issued tickets to philanthropic institutions for distribution; and if the holder of a ticket fetched the bag from the works, the charge was 4d. The system had been found to work well.

Mr. H. Kendrick (Stretford) said that Mr. Newbigging, in his remarks about market gardeners, was having a litttle dig at Stretford; but there was the fact that consumers came past the Gaythorne works of the Manchester Corporation to purchase coke at Stretford, and paid 4d. more per ton for it, which would seem to indicate that they preferred the Stretford coke. Turning to deal with the figures given by Mr. Watson in his paper, Mr. Kendrick showed that at Stretford the coke made for sale was 9·87 cwt. per ton of coal carbonized, and said he did not see it was possible to get much more.

Mr. Watson, replying upon the discussion, said there was not much for him to answer; the different speakers generally supporting what he had said on the subject. He admitted there was some force in what Mr. Newbigging had said about the advantages a company had over a corporation engineer in regard to the disposal of coke. But he still adhered to his argument that more could be done in the way of encouraging local trade. Then as to the cost of handling coke in small quantities, this was very low, but, of course, would vary in different localities. He agreed with Mr. Halliwell that the Commercial Sections could do much to stimulate the sale of coke locally. What they wanted was concentrated action, and they would then have little difficulty in getting rid of their surplus coke.

On the proposition of Mr. Brearley, seconded by Mr. Samuel Glover (St. Helens), a hearty vote of thanks was accorded Mr. Watson for his paper.

NEW GASHOLDER TANK NOW CONSTRUCTING AT BRADFORD ROAD GAS-WORKS, MANCHESTER.

By J. G. Newbigging, M.Inst.C.E.

[Prepared for the Manchester Institution of Gas Engineers Meeting, Feb. 27.]

The new tank which is in course of construction at the Bradford Road station is 285 feet internal diameter, and 46 ft. 6 in. deep to the bottom of the footings, and is to receive a four-lift gasholder of a total capacity of 10,410,000 cubic feet, which will form the nucleus of a new section of the works to be erected on the adjoining land.

The Site.

The site of the structure is at the north-easterly extremity of the Bradford Road works, on land at an altitude of about 8 feet above the general level of the rest of the works.

Before finally deciding on this site, five boreholes, 4¼ inches in diameter, and ranging from 50 feet to 80 feet deep, were sunk, in order to ascertain the nature of the underlying strata—one in the centre of the tank, and the remainder round the circumference, at equidistant points, in the middle of the wall trench. The boreholes proved the substratum to be mainly boulder clay at their upper sections, finishing with grey shale at their lower sections, with thin bands of marl and black shale intermedially.

The contract for the construction of the tank was accordingly let, and work commenced on the 11th of November, 1907. Land covering an area of 37,428 square yards (including the area occupied by the tank) was placed at the disposal of the contractor during the execution of the work, and was enclosed within a sleeper fence, so as to separate it from the rest of the works.

The site was first levelled to an average depth of 6 feet; the quantity of material removed for this purpose being 29,960 cubic yards. The circular trench was then excavated to receive the wall. It measured 301 feet in external diameter, by 16 ft. 6 in. wide, and 50 ft. deep, except at the point where are the inlet and outlet pipes, which was excavated to a depth of 56 ft. 9 in. for a length of 41 ft. 6 in. In the positions occupied by the main piers, the trench was recessed back 3 ft. 6 in. for a width of 11 ft. 3 in. The outer wall of the excavations at the bottom, with the recesses for the piers, was undercut 2 feet back, to allow for putting in the foundations.

The Excavation.

In order to support the sides of the trench while the building of the tank was in progress, a very complete system of timbering was adopted. The struts, walings, and punchings were mainly of pitch pine, measuring 9 inches square; the poling boards of Baltic white timber, 8 inches by 1½ inches; and close timbered. The first ring of timber was 8 feet deep, and the remainder 4 feet deep—there being ten rings altogether in the depth.

The struts were fixed five to each bay; those at the counterforts being 18 feet long, and the intermediate struts 14 ft. 6 in. long. The total number of struts was 1600. The walings at the counterforts were 11 ft. 3 in. long, and intermedially 18 ft. 6 in.—there being 64 of each in the circle, or a total of 1280. The punchings were cut to a suitable length to fit in between the walings.

The total quantity of timber used in the trench was as follows: Polling boards, 89,500 sup. ft. × 1½ inches thick; waling timbers, 14,660 cubic feet; struts, 18,330 cubic feet; and punchings, 3000

cubic feet. The quantity of material removed in excavating the trench was 31,391 cubic yards.

The strata revealed by the excavation fully confirmed the earlier investigations made with the boreholes. The whole of the ground was solid, and showed no signs of subsidence or damage from coal workings. The fact that underneath the site of the Bradford Road works is undermined, and it being known that shallow seams of coal had been worked in the vicinity of the tank, about the end of the Eighteenth Century, rendered it necessary that more definite information should be obtained with regard to the position of these before the building of the tank wall was commenced.

In order to ascertain if any of the shallow seams of coal had been worked sufficiently near to the base of the tank to be likely to cause damage to the structure, headings were driven from several points in the bottom of the tank excavation in a lateral direction for a distance of 30 to 40 feet. On examining the strata revealed by these headings, no indication was found that there was any danger to be apprehended to the tank from the working of the shallow seams of coal; so the headings were filled up with concrete tightly rammed, and the construction of the tank was at once commenced.

In order to deal with the water in the excavation, four sump-holes, each 6 feet square, three of them 56 feet deep, and one 63 feet deep, sunk at equal distances apart, had been provided in the specification, together with a system of 9-inch drain-pipes running round the bottom of the inner and outer sides of the trench, and connected by cross drains to the sumps. The quantity of water met with during the work of excavating the trench was small, and was mainly surface water; so the forming of these sumps and system of draining was not proceeded with.

The clay puddle used for the tank was selected from the excavated material and stored on the site to weather, and carefully tempered by being passed through pug-mills before use. The quantity of puddle used in the contract was 7940 cubic yards.

The clay puddle under the foundations is 12 inches thick, and was well trodden in, punned with flat punners, and levelled to a uniform thickness. The whole of the bottom of the trench was covered with puddle before the contractor was allowed to commence the laying of the concrete foundations.

The concrete in the foundations is 2 ft. 6 in. thick, composed of one part of cement, one part of sand, and four parts of aggregate, consisting of bricks, clean hard stone, and old fire-clay retorts, broken to such a size as would pass through a 1½-inch ring—the proportion of clean hard stone being not less than one-third.

The Tank.

The footings consist of eight courses of bricks commencing with eleven bricks thick and diminishing by half-a-brick each superior course. The tank wall is built in Old English bond, and is seven bricks thick above the footings for a height of 16 ft. 6 in. From thence, it is reduced by half-a-brick at every 4 feet in height; finishing with three-and-a-half bricks thick for a height of 3 ft. 6 in. at the top—making the total height of the wall 44 feet.

The main piers, 32 in number, are 11½ bricks deep and 8 bricks wide throughout, with eight courses of footings commencing with 15½ bricks deep and 12 bricks wide. The secondary piers, 32 in number, are carried straight from the first set-off in the wall, and are 7 bricks deep and 5½ bricks wide.

The whole of the brickwork is laid in cement mortar composed of three of sand to one of cement by measure—carefully measured in boxes, thoroughly mixed together dry on a platform, and then placed in mortar mills, slaked, and further mixed to a proper consistency. The puddle behind the walls and piers is 2 feet thick.

No dry well has been provided for the outer legs of the inlet and outlet pipes, nor has the wall been recessed back for their reception. The circle of the tank is unbroken, and two circular tunnels, each 5 ft. 9 in. diameter, formed with four 4½-inch brick rings, are built in the wall, through which the inlet and outlet pipes pass to the outside. The space round the pipes in the tunnels and outside is carefully filled in solid with puddle.

Plates of ⅜-inch steel plate, 6 ft. 9 in. long by 4 feet wide, are built into the wall at a depth of 12 feet below the top of the base stones, with six 3-inch steel bolts 13 ft. 3 in. long, for anchoring the standards of the gasholder.

The stone used throughout the work is Fletcher Bank. The guide-stones, five in the centre-line of each main and secondary pier (or 320 stones in all), are 2 ft. 3 in. wide by 1 ft. 9 in. deep. They are built into the wall with a 3-inch projection. Before the guide-rails are fixed, the faces of the guide-stones are dressed off, leaving a projection of 2½ inches. Four 1-inch rag bolts, 9 inches long, are let into each stone to which the guides are fixed.

The rest stones, 64 in number, are 7 ft. 6 in. long by 3 ft. 6 in. wide by 1 ft. 6 in. thick, and are bedded in cement with their inner ends against the face of the wall. The main pier stones are 9 feet long by 6 ft. 3 in. wide by 2 feet thick, with rounded arrises.

The top of the tank wall is surrounded by coping-stones, 2 ft. 9 in. wide by 6 in. thick, cut to the curve of the wall, with radiated joints. At the intermediate piers, the coping stones are 5 ft. 6 in. deep by 4 ft. 4 in. wide by 6 in. thick. Above the coping will be placed a curb of stones, 18 in. high by 12 in. thick with semi-circular top, held together with slate dowels run in cement. The quantity of stone used is 10,225 cubic feet.

The dumpling will be formed at an angle of 40°, after the tank wall is completed—built in three steps, and covered with puddle 18 inches thick, and concrete 18 inches thick. Underneath the stanchions carrying the tank framework, will be formed 180 concrete blocks.

The trammel is of steel built up in the form of a fish-back lattice-girder, triangular in section; the total length from the centre of the column to the end of the trammel being 142 ft. 6 in. At a distance of 13 ft. 3 in. from the end is fixed a carriage, with rollers travelling on a circular rail, 258 ft. 6 in. in diameter; the rail being spiked-down to a bed of sleepers for the whole circumference of the rail.

Brickmaking.

The clay from the trench has been stored on the ground, to be used as required for brickmaking and puddle. The brickmaking plant has been erected by Messrs. H. Harrison and Sons, who are Sub-Contractors for the manufacture of bricks to Messrs. E. Nuttall and Co., the Contractors for the construction of the tank. It consists of a grinding pan in which the clay is tipped from self-tipping waggons; the larger stones having been previously extracted by hand. After thorough grinding in this pan, the clay is passed through two sets of grinding rollers, set in tiers, by which means any stone is thoroughly crushed into powder. The clay then passes into a pug-mill, where it is thoroughly mixed, and then forced through the die on to a cutting table. The plant is capable of making 30,000 bricks per day. The bricks are taken from the table, packed on to trolleys, and then sent through the drying shed into the kiln.

The kiln itself is the most novel portion of the plant; being of the Hoffman or continuous-burning type, in place of the usual chambers. The kiln is entirely open; there being only the end walls and the piers, in which latter are placed the side flues and dampers. The main flues run parallel to the kilns one on each side, joining together at the top, and then passing to the drying sheds. When filling the kiln with bricks, air is prevented from passing in (except in its legitimate way) by plastering up the green bricks with brown paper. The green bricks are covered on the top with a course of red brick, and then with 3 inches of dust; but provision is left for feeding the chambers as required, both with air and with coal or breeze. No chimney is used for this plant; the gases being drawn through the kiln by means of fans and then discharged into the drying shed. Thus the heat generated is entirely used up before being passed into the atmosphere; and great economy of fuel is thereby obtained. The bricks made by this process are extremely hard, well shaped, and of good colour—being much superior to the usual common brick of the district. Over 3,000,000 will be used in the construction of the tank wall; and there will be required about 1100 tons of Portland cement, and about 2250 tons of sand for setting them in.

Cost of the Tank.

The contract amount for the construction of the tank is £34,115, including the cost of clearing the ground on which the tank is constructed, or (say) £3 5s. 6d. per 1000 cubic feet of gasholder capacity. Against this, must be placed the saving in the cost of levelling the remainder of the ground within the sleeper fence— an arrangement having been made with the Contractors for the tank to level this ground free of cost, and manufacture bricks from the clay recovered. A royalty is also paid per 1000 bricks made; it being estimated that there is clay available for the manufacture of 20 million bricks.

The brickwork of the tank is completed; and the stipulated period for the completion of the whole of the contract is June 30 next.

After the formation of the dumpling, the tank will be tested with water—its capacity being about 9 million gallons. Messrs. Ashmore, Benson, Pease, and Co., the Contractors for the tank-framing, and gasholder and framing, will then commence their contract, which is due for completion by December next year.

DR. RIDEAL ON GAS HYGIENE.

London and Southern District Junior Gas Association.

On Friday evening, the members of the Association gathered at the Cripplegate Institute, to hear Dr. Samuel Rideal lecture on "The Hygiene of Gas Lighting;" and they had explained to them at first hand many matters which it is important should be kept in mind in connection with gas and its use. A series of lantern slides added to the interest of the lecture.

In opening, Dr. Rideal remarked that it was a great pleasure to him to come and talk to them on a subject which they knew all about. Really he was outside the industry they were connected with; and therefore it might be somewhat presumptuous of him to speak to such an audience on matters which they were dealing with every day of their lives. His connection was with public health; and therefore his duties took him among water, sewage, and also gas engineers—his work being usually to analyze their products. Then generally the question arose as to whether they were likely to be injurious to health. In time he found that, in addition to the ordinary gas testing for illuminating value, there were hygienic problems arising out of the sulphur in gas and from the products of combustion. From very early days in the industry, people, of course, had been frightened that coal

gas was going to do all sorts of harm. At the very beginning, there were alarmist articles in the papers saying that an explosive thing like coal gas should not be tolerated for a moment—that towns would be blown up and everybody killed, and so on. These suggestions did not, however, crush the growing industry; and the explosiveness of gas when mixed with air was now recognized, and the precautions taken made the danger an insignificant one. Later on attention was drawn to the poisonous ingredients—first of which came carbon monoxide.

Carbon monoxide in pure coal gas, however, did not reach a very large amount—perhaps 6 or 7 per cent. might be the maximum in coal gas as it used to be made. But it was a very deadly poison; and therefore it was alleged that the leaks which must obtain, even with the best fittings, would be likely to produce poisonous symptoms. This was a very early attempt to decry coal gas from a hygienic point of view. With the introduction of water gas, the quantity of carbon monoxide present in gas supplied by undertakings which used this plant had naturally gone up. In America, in places where crude water gas was used, it often reached 20 per cent. A few years ago, a Commission was appointed with a view to limiting the quantity of carbon monoxide to be present; but after discussing the matter for a long time, the Commission came to no definite conclusion. In one statement put forward, it was alleged that the deaths occurring from carbon monoxide poisoning had increased enormously in America where water gas was used, and these deaths increased as the cube of the percentage of the carbon monoxide present in the gas. In other words, Dr. Haldane, he believed it was, said: "Supposing you have 1 per cent. of carbon monoxide in the gas leaking into the air of a room, you might have one death; but if you had 2 per cent., you would have eight deaths; and with 3 per cent., 27; and so on." This was the kind of evidence that was put before the Commission to show the awful character of that constituent of gas; but, notwithstanding all this—and it was a very carefully thought-out inquiry—no legislation had been made with regard to the limits of carbon monoxide in illuminating gas, and statistics showed that there had been no increase in the deaths from the increase of carbon monoxide now in the gas supply in this country.

Of course, every now and again there were explosions due to gas leaks; and they had poisoning cases resulting from gas being turned on wilfully—either suicides, murders, or the consequence of carelessness or ignorance. These, however, were unavoidable accidents; and when they were all totalled up, one found that the incidence of death arising from the gas industry was no greater than that of any other commercial enterprise going on in the big towns. Certainly, it was far less than in the case (say) of the motor industry.

Coming to the hygiene of gas, this was more concerned with the question of whether in living-rooms it was desirable to allow gas to be burnt without any aids to ventilation. The point as to whether flueless stoves were hygienic had been debated for a great number of years. They had to consider, not so much the ingredients of the unburnt gas, as what were the products of its proper combustion. These products were carbonic acid and water, the sulphur oxides, and, of course, heat. The quantity of sulphur in gas had always been the subject of legislation; and the sulphur had been divided under two heads—the sulphuretted hydrogen and the other sulphur compounds. This was a right and proper chemical division. From the early days, sulphuretted hydrogen had been practically prohibited in gas as supplied to the consumer; but the other sulphur compounds could not be entirely removed by any known means, and there must be from 10 to 20 grains of them per 100 cubic feet even with the adoption of the best method of purification. In London and many other parts of England there had until quite recently been a restriction applied to these other sulphur compounds; and lime purification was therefore resorted to. Why there should be this difference, it was hard to say, from a health point of view, because when coal gas was burnt all the sulphur compounds were oxidized to sulphurous acid, and finally to sulphuric acid. The proper legislation from the beginning would have been—if the sulphurous acid was injurious to health—that no coal gas should be supplied to the consumer which on burning produced so much sulphur in the form of sulphurous acid. This would have enabled gas manufacturers to allow a certain amount of sulphuretted hydrogen to be present in the gas as delivered to the consumer. Sulphuretted hydrogen itself was not injurious; it was the sulphurous acid produced by the burning of all the sulphur compounds in the coal gas which might be so. To Sir George Livesey belonged the credit of removing the anomalous state of affairs which existed in this respect.

Continuing, Dr. Rideal said that one of the first pieces of work he did with regard to this sort of thing arose over an inquiry as to nuisance caused by gas lime in connection with what was now the South Suburban Gas Company. Sir George Livesey asked him to go on to the Continent and see whether they had the same difficulty there with regard to lime. He visited Brussels, Berlin, Vienna, and Paris, and found that lime purification was practically unknown. Only in Brussels was a small quantity of lime used—the man in charge of the purifiers following an old habit in this respect. Action was taken; and eventually the repeal of the sulphur clauses in London and many other places became an accomplished fact, though not before a Committee had been appointed to inquire into the testing of gas in the Metropolis.

The lecturer described the work he did, through Sir George Livesey, for the South Metropolitan Gas Company in connection with this inquiry. He pointed out that it was not sufficient to show that lime purification caused a nuisance in getting rid of the spent material; one had to inquire where gas manufactured from English coal, if purified only by oxide of iron, would be injurious to health, or rather where there would be a large increase in the quantity of sulphur in the air of a room after burning gas if lime purification was done away with. Two rooms in a workman's cottage in the Old Kent Road were arranged so that they could be supplied with gas that had been purified with oxide of iron alone, or with gas purified by oxide of iron and lime. Gas was burnt in the rooms; and they proceeded to determine the quantity of sulphur in the air. Their first surprise was when they found no difference in the quantity of sulphur in the air in the room, whether the gas had been purified by lime or not. This was startling; but what was more surprising was that they discovered that the quantity of sulphur in the air of the rooms was no greater, and often less, than that in the air outside. The total sulphur in the air in the Old Kent Road varied from a minimum of 0·0082 grain per 100 cubic feet to a maximum of 0·0235 grain during the inquiry. In the country where he lived, at Elsted, the amount of sulphur in the air was only about one-fifteenth of this; while in foggy weather, outside St. George's Hospital, he had got as much as 0·12 grain per 100 cubic feet. During their investigations, they discovered that only after burning gas for a very long time in a closed room could they get sulphur in the air in anything like the quantities found outside; and there was no difference whichever gas was used. The method of determination adopted had, of course, to be very much more refined than that for determining the sulphur in coal gas. The explanation of this was the absorbing action of the ceiling and walls, the lime in which absorbed the sulphur acids and was converted into sulphate of lime. This absorption of the sulphur acids produced by the burning of gas continually went on; and the room acted in the way of a lime scrubber—but much better. The more gas that was burnt, the more of the outside air was pulled into the room (if the doors, windows, and fire-places were closed) through this basic lining; and so the burning of the gas, which was producing sulphur acids, was actually diminishing the quantity of sulphur in the air. It was estimated that 1000 tons of sulphuric acid a day were produced from the coal burnt in the ordinary way in domestic grates in England. Fortunately this sulphuric acid was usually associated with black smoke and soot; and therefore when the fog containing it was seen windows and doors were shut to keep it out. Therefore much of the air that came into rooms in towns did not enter through windows, but filtered through the basic lining of the ceilings and walls; and in doing so, the sulphuric acid was fixed, and the soot was kept on the outside, which made the air inside better than that outside.

Well, as he had said, the result arrived at with regard to the tests of these rooms was at first startling; but really it was pretty obvious. Lord Rayleigh's Committee came down and visited the place. They did not credit the results at first; but the varnishing of the walls and ceilings, to prevent them acting as a filter, was undertaken, and then the sulphur in the room increased. A good deal was deposited condensed with the moisture on the windows. In dealing with the hygiene of rooms, it was important, therefore, if they wished to take the sulphur from the air, to ensure this porosity of the ceilings and walls. The quantity taken up was very easily calculated by those who knew a little chemistry; for 100 lbs. of carbonate of lime (whitening) would absorb 32 lbs. of sulphur. The coat of whitewash used on a ceiling was generally 12 lbs. per 100 square feet. He had two rooms of his in Victoria Street whitewashed. In one he used gas, and in the other electric light. Two months later the room with no gas had only 0·168 per cent. of sulphur in the ceiling plaster; while in that of the room where gas was burnt the percentage of sulphur was 0·504. Therefore in one case there was five times as much sulphur fixed in two months as there was in the other. The actual amount of material used in the gas room was 45 lbs. of carbonate of lime (whitening); and it had absorbed 473 grains in eight weeks. The quantity of gas used was 10,000 cubic feet; and the amount recovered was thus about 5 grains per 100 cubic feet, out of perhaps a little more than 20 grains—that was, roughly, 25 per cent. of the sulphur was fixed. It came to some hundreds of years before the whitening would be completely used up by the sulphur in an ordinary room. He did not examine the walls; but, of course, some of the sulphur went there. Walls and ceilings were therefore far more efficient purifiers than any lime purifier at a gas-works could be.

Dr. Rideal next turned his attention to the other constituents—carbonic acid, water, and heat, and the problem of whether these were injurious to health. It happened, he said, that all three were also produced by men and animals; so that if they were injurious in one case, they were similarly so in the other. Therefore one was, of course, brought to the question of ventilation; and it must be obvious to all that a room must be properly ventilated, even if it was not lit by gas. Among these products, the physiologists and the medical men had, until quite recently, always said that the carbonic acid was the injurious one—why, he did not know, except, perhaps, that it was easy to determine the quantity present. In factory legislation and in books on public buildings, the opinion as to the existence of proper ventilation was based on the quantity of carbonic acid present. No one knew, however, what this proper amount was. Outside air contained about 4 parts per 10,000; and therefore anything over this in a

room showed that the air was not so good from that point of view as the outside air. He and his assistants, and many other people, had, however, lived in rooms containing as much as 50 per 10,000 of carbonic acid, without apparently any injurious effects; and as a matter of fact, most persons were accustomed to take large amounts of carbonic acid, either in beer or mineral waters, so it could not be so very harmful. He believed that it was not injurious, and that the uncomfortable effects of a stuffy room were not due to the increase of carbonic acid, but to the other two things—water and heat.

Some three years ago, it was thought that it would be interesting to see whether he could detect the quantity of carbonic acid, moisture, and heat produced by gas, and compare it with the amount produced by people. The experiments were carried out by him in Victoria Street, in two special rooms, which were made as tight as possible; and the extraordinary thing was that even when all the natural ventilation was shut off, they still found, with different illuminants, very considerable ventilation through the walls. So much so, in fact, that the air was changed in a room of this character once every two hours. They fitted up in each room two inverted bijou incandescent gas lights, of 25-candle power, each consuming 1¼ cubic feet per hour, and in addition they had two 25-candle electric lights consuming 100 watts per hour; so that they could be illuminated by either method. With people sitting in the rooms, the quantity of water, carbonic acid, and heat produced was then determined. Now it was frequently thought that if gas was burnt in a room it was like a closed box, and that the products present went on increasing; but one ought really to regard a room, not as a stagnant pond, but rather as a lake, in which as the gas current was passing out the fresh air was entering. When the rate at which the gas was being burnt was constant, and that of the air entering was constant—depending upon the difference between the inside and the outside temperature and on the wind—under these conditions, they would get after a certain number of hours a constant composition of the air. Therefore there would be a certain point when the percentage of carbonic acid and moisture and temperature would remain steady. They were able to ascertain how long it took to reach this steady state. They put carbonic acid into the room up to about 50 per 10,000, churned up the air with an electric fan, and then measured the rate of leakage out of the room. From the loss of carbonic acid, they were able to ascertain the rate at which the fresh air was coming in. In a 5000 cubic feet room, with the fireplaces and ventilators closed, there was an average of 2600 cubic feet of air per hour entering the room before lighting-up time. During the lighting hours the ventilation, with gas, was equal to 3525 cubic feet, and with electricity to 3355 cubic feet; while after the lights were out, the ventilation began to fall again, and was only 3213 cubic feet. The actual quantity of carbonic acid produced per man per hour came to about 0·8 cubic foot; and the two gas-burners produced 1·5 cubic feet per hour. The burners produced in water some 1000 grains; and a man in breathing gave off roughly 700 grains. As to heat, 2½ cubic feet of gas per hour gave 1380 B.Th.U.; and the two electric lights gave 658 B.Th.U. The latter were carbon filaments; probably metallic filaments for the same amount of illumination would only give some 300 or 400 B.Th.U. A man gave out 446 B.Th.U. gross, and 340 B.Th.U. net—the difference in these two figures being the amount of heat required to vaporize the 700 grains of water per hour. These results showed that electricity gave about half as much heat per hour as one man; while gas gave roughly about three times as much heat as a man. The burners gave twice as much carbonic acid as a man, and half as much again in the form of water as did a man. These figures were a sort of average. The greater amount of ventilation produced by gas than by the electric light was owing to the greater heat of the former. The occupants of a room had far more effect upon the quality of the air of that room than did the gas, so that the quality of the air depended much more upon the number of people than upon the system of lighting. In a room of 2000 cubic feet, with a bijou burner of 25 candles consuming 1 to 1½ cubic feet of gas per hour, with walls and ceilings of plaster, no chemical or physiological test that he knew of could be devised to indicate that the lighting was not other than electric light or daylight.

Coming to his last point—the germicidal qualities of gas as compared with electric light—Dr. Rideal said that this was very important. As they knew, there were germs produced in many diseases, which were blown out into the air of a room. These floated about; and if they were drawn into a flame along with the air supply, they were cremated. Thus one found that the air of a room when gas had been burnt in it was sterile, as compared with that where electric light was used. However, besides this cremating effect of the hot flame, any organisms that might escape went through the air along with the moisture and sulphur acids produced, and were deposited on cold surfaces, and were there killed by the acids. If they examined the water condensed on a window in a room where gas had been burnt for a few hours, they would find it was practically free from organisms; while the condensed water in a room where the electric light was used would contain organisms. Therefore he thought the germicidal effect of gas was one of the things that ought to be taken into careful consideration in discussing the advantages of this method of lighting.

On the proposition of the PRESIDENT (Mr. W. J. Liberty), seconded by Mr. W. UPTON, a hearty vote of thanks was passed to Dr. Rideal for his lecture.

SOME EXPERIMENTS ON REFLECTIONS FROM CEILING, WALLS, AND FLOOR.

These tests were undertaken by Messrs. V. R. Lansingh and T. W. Rolph for the purpose of determining the values of the reflection of light under average conditions of artificial lighting. They subsequently formed the subject of a paper read at the recent annual meeting of the Illuminating Engineering Society held at New York. To obtain the several reflection values dealt with, actual measurements of illumination were made with each of eight possible combinations of light and dark ceiling, walls, and floor. With the data obtained, the authors then analyzed (1) the values of the increase in illumination under the various conditions, (2) the effect of reflection on uniformity of illumination and further, (3) determined the angle below which lumens generated became lumens effective.

The room selected measured 24 ft. 3 in. long, 11 ft. 6 in. wide, and 10 ft. 1 in. high. It was windowless, the walls were lined with dark green burlap, the floor was nearly covered by dark green rugs, and the uncovered part, with the doors, was stained a dark cherry colour. Tests were made under these conditions and contrasted with others in which reflection effects were produced by means of linings of light cream coloured wrapping paper. Although the contrast perhaps could have been made sharper by using respectively dull black and white surfaces, it may be that the conditions actually employed represent the extremes to which room decorations are likely to go; and the authors' results, therefore, indicate the range of gain or loss, as the case may be, which is within the power of the user of light.

Four different sets of tests were instituted, the light units being tungsten lamps (40-watt, 115 volt) employed as follows: (*a*) One bare lamp close under the ceiling and in centre of room; (*b*) the same with a bowl reflector; (*c*) three bare lamps similarly placed; and (*d*) the same equipped with bowl reflectors. In each case illumination tests were made under the following conditions:—

Test No. 1—Ceiling, walls, and floor dark.
" 2—Ceiling light, walls and floor dark.
" 3—Ceiling and walls light, floor dark.
" 4—Ceiling, walls, and floor light.
" 5—Walls light, ceiling and floor dark.
" 6—Walls and floor light, ceiling dark.
" 7—Floor light, ceiling and walls dark.
" 8—Ceiling and floor light, walls dark.

The room being assumed to be rectangular, one fourth part of it was divided into eight square yards, and the illumination in foot-candles was taken at the centre of each. The average of the eight readings was regarded as the average illumination of the place. The photometer was a Sharp-Millar, equipped with a 112-volt standard lamp. The authors furnish full details of all their tests, which were made at a height of 2 ft. 6 in. above the floor level; but it will be sufficient to abstract in tabular form the mean results they obtained.

Table of Mean Results.

Conditions as Above.	(*a*) One Bare Clear Lamp.	(*b*) The Same, Frosted Tip, with Prismatic Reflector.	(*c*) Three Bare Lamps.	(*d*) The Same, Frosted Tip, with Reflectors.
Test No. 1, foot candles .	0·19	0·36	0·48	0·91
" 2, " .	0·34	0·48	0·94	1·17
" 3, " .	0·56	0·63	1·57	1·74
" 4, " .	0·68	0·90	1·96	2·27
" 5, " .	0·31	0·43	0·85	1·15
" 6, " .	0·34	0·49	0·92	1·23
" 7, " .	0·21	0·37	0·50	0·90
" 8, " .	0·37	0·49	0·99	1·20

The authors then proceed to analyze the various values obtained in order to show how far the several factors separately contributed to the increased illumination. Their method is detailed; and the percentage increases of light over the conditions of Test No. 1 with dark ceiling, walls, and floor is given as below.

Light Sources.

—	One Bare Lamp.	One Bare Lamp with Reflector.	Three Bare Lamps.	Three Lamps with Reflectors.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Increased illumination due to—				
N_1—Ceiling alone . . .	79	33	96	29
N_2—Walls " . . .	63	19	77	26
N_3—Floor " . . .	11	5	4	−1*
Additional increase due to interaction of—				
N_4—Ceiling and walls . .	53	23	54	37
N_5—Ceiling and floor . .	5	0	6	4
N_6—Walls and floor. . .	5	12	11	10
N_7—Ceiling, walls, and floor	42	58	60	45
Total	258	150	308	150

* This negative value is obviously the result of a slight error.

Of the above, it will be seen that the factors of importance are four—viz., the ceiling, the walls, the interaction of ceiling and walls, and that of ceiling, walls, and floor. The authors point out

that the ceiling and walls, as would be expected, have a greater effect with bare lamps than with reflectors, and the walls play a greater part with three lamps than with one; this being true of the ceiling when bare lamps are used. Attention is particularly drawn to the three lamps with reflectors, which method would be more commonly met with in practice, and the resultant increase in illumination due to light-coloured surroundings.

The paper next deals with the effect of reflection on uniformity of illumination, which may, the authors say, be brought about in three ways:

1.—An illumination of the same value at all points may be added to the direct illumination, thus increasing the uniformity.

2.—The higher values produced by direct illumination may be increased by reflection less than the lower values, thereby increasing the uniformity.

3.—The higher values produced by direct illumination may be increased by reflection more than the lower values, thereby decreasing the uniformity.

In order to analyze the effect in detail, the several values of N_1 to N_7 (see above) are given in full for each test. The mean values and the maximum variations (as obtained at any one testing-station) from these values are abstracted as under:—

Conditions of Test.	(*a*) One Bare Clear Lamp.		(*b*) One Frosted Tip Lamp with Reflector.		(*c*) Three Bare Clear Lamps.		Three Frosted Tip Lamps with Reflectors.	
	Foot Candles	Max. Variation.	Foot Candles	Max. Variation.	Foot Candles	Max. Variation.	Foot Candles	Max. Variation.
All dark as Test No. 1	0·19	..	0·36	..	0·48	..	0·91	..
N_1 . . .	0·15	206%	0·12	117%	0·46	52%	0·26	46%
N_2 . . .	0·12	−58%	0·07	−86%	0·37	−11%	0·23	61%
N_3 . . .	0·02	100%	0·005	..	0·02	100%	..	..
N_4 . . .	0·10	40%	0·08	−63%	0·26	23%	0·33	−55%
N_5 . . .	0·00	..	0·00	..	0·04	..	0·04	..
N_6 . . .	0·01	..	0·05	385%	0·05	100%	0·10	130%
N_7 . . .	0·08	138%	0·22	68%	0·28	61%	0·40	−93%
Total N .	0·48	..	0·54	..	1·48	..	1·36	..

Commenting upon the data obtained in case (*a*), the authors remark that the floor alone, the interaction of the floor and walls, and that of the floor and ceiling have only a slight effect on the intensity, and therefore the uniformity, of the illumination. The reflecting value of the ceiling is not uniform; being greatest directly under the light source—a consideration which should receive especial attention in designing a lighting system. The walls add a fairly uniform illumination (highest near the light source), as do the interaction of the walls and the ceiling together. The variation produced by the ceiling is more than cancelled by the increased uniformity produced by the walls (N_2) and the interaction of the walls and ceiling (N_4).

In case (*b*), the effect of the ceiling is much the same. The walls, however, increase the uniformity by adding an illumination high at the sides and low near the centre. The additional effect caused by the interaction of the walls and ceiling is not great; but since the walls and ceiling each alone increases the uniformity, they together effect a considerable increase. In the tests with three bare lamps (*c*), the results are somewhat similar to those in (*a*). The walls add an illumination which is practically uniform, and the combined effect of the ceiling and walls is also in the same direction. The effect of the ceiling and the floor is to raise the low points in the illumination added by the ceiling alone. In case (*d*), the authors again noted the small effect of the floor; the tendency of higher illumination nearer the centre than the sides being due to the ceiling, although making slightly for uniformity. The walls added an illumination higher at the sides than at near-by points, but highest directly in the centre. The interaction of the walls and the ceiling increased the uniformity by adding light at the sides and giving less near the centre. This combination and that of the walls and floor do much towards uniform illumination.

The third part of the paper is devoted to the determination of the angle below which lumens generated are lumens effective. Dr. Clayton H. Sharp's definition of a lumen as a unit of flux or quantity of light is quoted, and the authors then show the connection between lumens and foot-candles. One lumen will give one foot-candle intensity over an area of one square foot on a surface one foot away from the unit source of light. From this, the authors say, it follows that if the total flux of light in lumens is divided by the square feet on which the lumens fall, the average foot-candle intensity is obtained. Knowing the area of a room, the average foot-candle intensity can be determined from the effective flux of light; and the latter will depend upon the shape of the photometric curve and the amount of light reflected from the ceiling and walls. It is then stated that the most convenient way of applying the flux method of calculation is to determine from the photometric curve the mean candle power up to the angle below which the lumens generated are effective. This mean value of candle power is then multiplied by a constant which is the number of solid angles below the angle selected; and the product is the effective lumens.

The authors believe their experiments to be the first of the kind published. While the methods adopted may excite criticism, they hope the tests will form the basis of further work.

THE ONE-AND-A-HALF MILLION THREE-LIFT GASHOLDER AND CONCRETE TANK RECENTLY CONSTRUCTED AT DEVONPORT.

By J. M. Campbell, of Luton.

[**Abstract of London and Southern Junior Gas Association Paper.**]

(*Concluded from p.* 536.)

The gasholder was a three-lift one; the inner lift being 141 feet, the middle 144 feet, and the outer one 147 feet in diameter, and each lift 33 feet in depth. It was, of course, constructed over the water in the tank; the arrangements being rather novel and interesting. The entire work was constructed in mild steel, with the sole exception of the standard bases and the guide rollers, which were of cast iron. There were twenty of these bases of 1½-inch metal throughout, and of an ornamental design; and they were placed one on each of the main piers of the wall, and bedded on 6 lbs. sheet lead to take up any unevennesses, though they were planed on the bottom as well as on the top. They were 12 inches deep, open underneath, and had four sleeves cored through for the 2½-inch holding-down bolts built in the walling; and after being placed in position, and accurately set centre to centre, they were grouted in right up to their top with cement to prevent any movement.

The Gasholder Standards and Girders.

The lattice standards and girders were next erected by means of a high travelling derrick, which ran on rails laid around the outside of the tank circle. The standards were in four sections to make up their full height of 99 feet; the joints occurring at the centre of the intermediate girders, and having channel cover straps 2 ft. 6 in. long inside each member. The standards were built up of 10 in. by 3 in. by $\frac{7}{16}$ in. channel steel both back and front; the channels facing each other and being braced together with 4 in. by 3 in. by ⅜ in. tees (inside the channels straight across) and lattice bars ranging from 4 in. by ½ in. flat in the bottom length to 3 in. by ⅜ in. flat at the top.

The standards had a true batter from a point 2 ft. 6 in. up from the cast-iron base, where they were 3 ft. 3 in. wide, to just under the top girder, where they were 2 feet wide. They were widened out at the base to 4 feet (by 27 inches the other way), and had a sole-plate ⅜-inch thick of this size, which formed the very bottom of the standard. A ½-inch web plate, 2 ft. 6 in. deep, stretched across on each side of the channels joining these two members together; and along bottom, where this web plate met with the sole-plate, an 8 in. by 4½ in. by ¾ in. steel angle was riveted to each, and to the channels. This was turned up at the outer end to form a space with a ¾-inch back-plate 2 ft. 6 in. deep riveted to the back of the outer channel. This space was 1⅝ inches wide, and accommodated the flat, spade-like eye of the diagonal tie-rods, which was secured through same with 2⅛ inch diameter bolts—the same size as the tie-rods themselves. The angle-steel junctions were placed with the 8-inch way horizontal, so as to take the holding-down bolt ends; and they also took the tie-rod bolts just mentioned. Each of the three rows of intermediate girders were 2 feet deep; and where they were attached to the standards, a ⅝-inch wing plate 5 feet long by 3 ft. 5 in. wide, shaped like a shield, was riveted to the back of the outer channel. On each side (joining the back and front members) a ½-inch web-plate 4 feet deep was riveted.

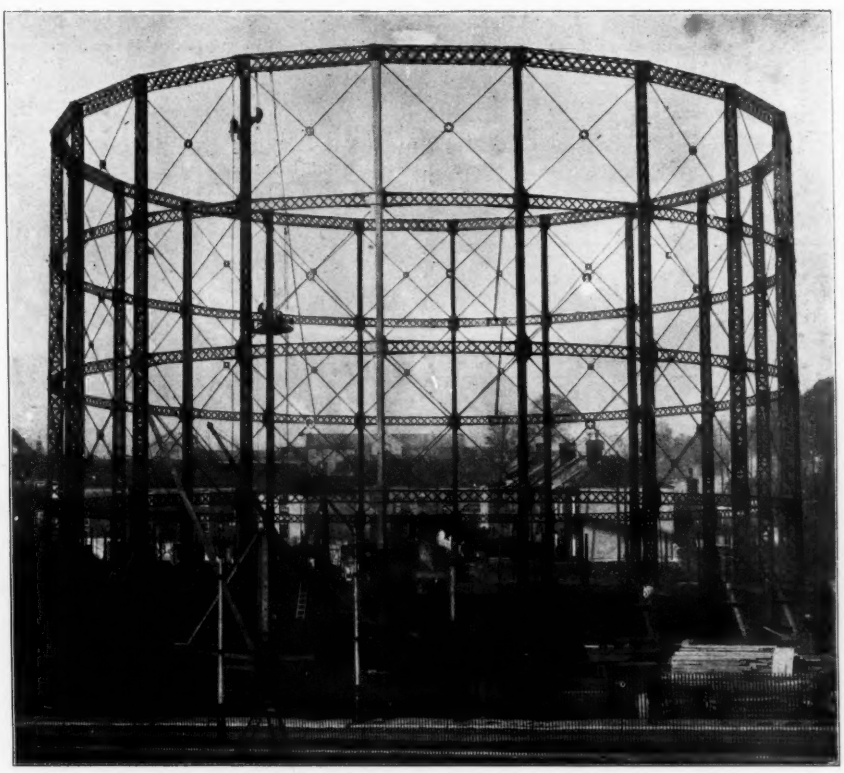
The intermediate girders were each formed of two 3 in. by 3 in. by ⅜ in. steel angles top and bottom, the outer ones of which ran straight across between, and were riveted to, the outside of the ⅝-inch back wing-plates, where their ends butted and were joined with angle cover straps. The inner and outer angles of the girders separated some 5 feet from the standard; and the inner one travelled inwards to, and butted against, the flange of the inner standard channel. The triangular piece of girder top and bottom was filled in with two pairs of 3 in. by ⅜-in. flat lattices. Riveted to the web and the back wing-plate of the standard, and travelling 15 inches along, and riveted to, this inner girder angle, were 3 in. by 3 in. by ⅜ in. U-shaped angles top and bottom, and all covered over on their outsides with a ½-inch web-plate 15 inches long, butting up to the vertical webs on the standards. Outside these, and riveted on both flanges, were the heavy angles (of 8 in. by 4½ in., 7 in. by 4 in., and 6 in. by 4 in. and by ⅝ inch thick each), turned up or down on the upper or lower side of the girder respectively, and leaving the necessary space with the back wing-plate to take the eye of the diagonals as just described for the standard base, and which was also riveted to the standard web and the channels. The girders on their vertical faces were latticed along their length with 3 in. by ⅜-inch flat bars laid diagonally.

The standards at the top were similarly constructed with regard to the attachment of the girders to them, only that the ½-inch horizontal web-plate (joining the girders to the standards) spread right over the top of the standards, and extended over both the upper members of the girders on each side. In place, also, of the U-shaped angle junction-pieces, the inner girder angles were kneed the full width of the standard, and riveted thereto through the ½-inch web-plate across the channels. The junction of the

two bottom members of this top girder was executed in precisely the same manner as already described for the intermediates; the heavy angle being in this case 5 in. by 4 in. by $\frac{5}{8}$ in., and similarly bent down to take the ends, with the back wing-plate, of the diagonal ties.

The top girder was of the box type, and was 2 ft. 6 in. deep and 2 ft. $3\frac{5}{8}$ in. wide over the angles, which were of the same scantling and similarly latticed to those described, but on all four sides. The horizontal flanges of the inner angles in this case pointed outwards; and the peculiar width was made up of the 2 feet width of standard, together with the $\frac{5}{8}$-inch thick back wing-plate, and the 3-inch wide flange of angle outside same. To the front member of each standard a 6 in. by $2\frac{1}{2}$ in. by $\frac{7}{16}$ in. channel guide-rail was secured with $\frac{3}{4}$-inch rivets, 12-inch pitch (out of centre slightly), and with countersunk heads on the running face. They were joined to those in the tank (which, it may be remembered, stood 12 inches above the coping top) with flat straps $2\frac{1}{2}$ in. by $\frac{1}{2}$ in. by 18 in. long on each side, and with countersunk headed rivets on the inside. The other joints in this rail came 12 inches above those of the standard channels and had no junction straps, but were merely fastened with two rivets at each end through the standard channel. The top girders were bound together and to the standard tops with a network of angle and tee wind-ties, running round inside same, and braced at the centres of the girders and the top of each standard, all in the following manner.

Two 3 in. by 3 in. by $\frac{1}{2}$ in. angles ran, one from standard to standard, and the other between the centres of the girders. They met back to back at 3 ft. 6 in. from the face of the standard, where they were joined together, and rested on a continuation of the guide-rail, which was carried out to form a bracket. On the top of this arm was a $\frac{1}{2}$-inch junction-plate 12 inches to 6 inches wide and 15 inches long, on top of which came the two aforementioned angles and a 4 in. by 3 in. by $\frac{1}{2}$ in. tee (with web looking up) butting against the outer angle tie, which stretched across on to the cover plate on the standard top; all being riveted together. From here these angles separated; the outer one cutting across to centre of the girders, where the ends from the two adjoining standards met, and were each kneed and carried along on, and riveted to, a 12 in. by $\frac{1}{2}$ in. junction-plate over, and secured to the girder top. Between the backs of, and riveted to, these kneed ends, a 3 in. by 3 in. by $\frac{1}{2}$ in. tee (web looking downwards) extended out for a distance of 3 ft. 6 in. from the girder, where it butted against the back of the inner angle-tie stretching between the standards, and where they were riveted together with $\frac{1}{2}$-inch thick knees 12 inches long. The joints in the inner angles came opposite the centres of the standards; the two ends being joined with an angle cover strap 2 feet long. Each standard was surmounted with a finial 3 feet high and 2 feet wide, built up of two $3\frac{1}{2}$ in. by 3 in. by $\frac{3}{8}$ in. angles, carried along on the top cover-plate, and then up in a line with the inner face of the standard, the back being curved. Over the angles, at front and around over the back, a 10 in. by $\frac{3}{8}$ in. plate



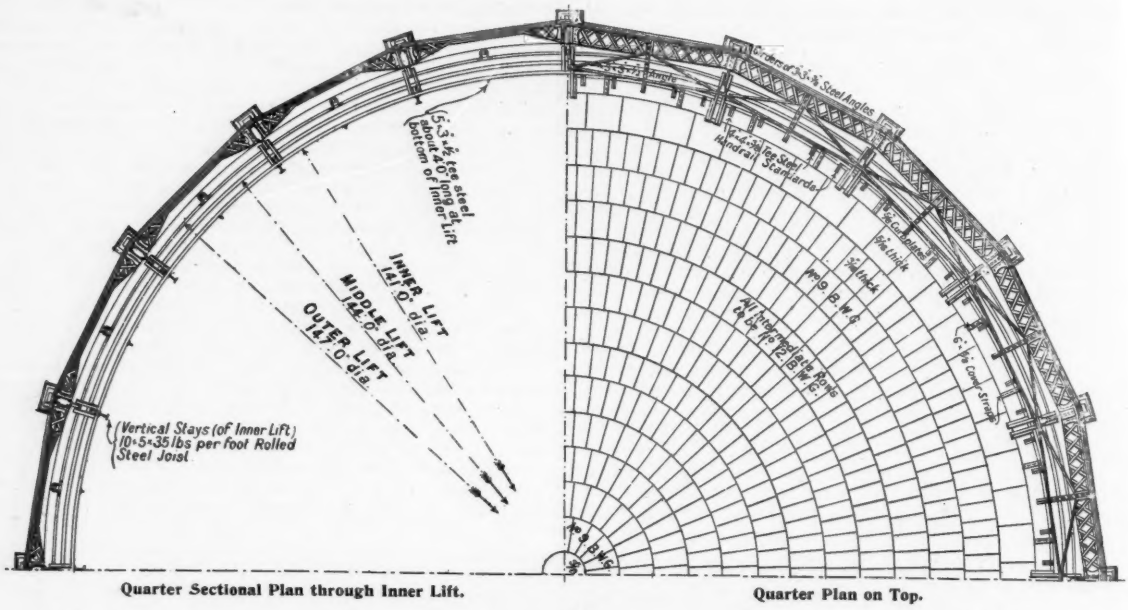
Three-Lift Holder at the Devonport Corporation Gas-Works—Capacity 1,500,000 Cubic Feet.

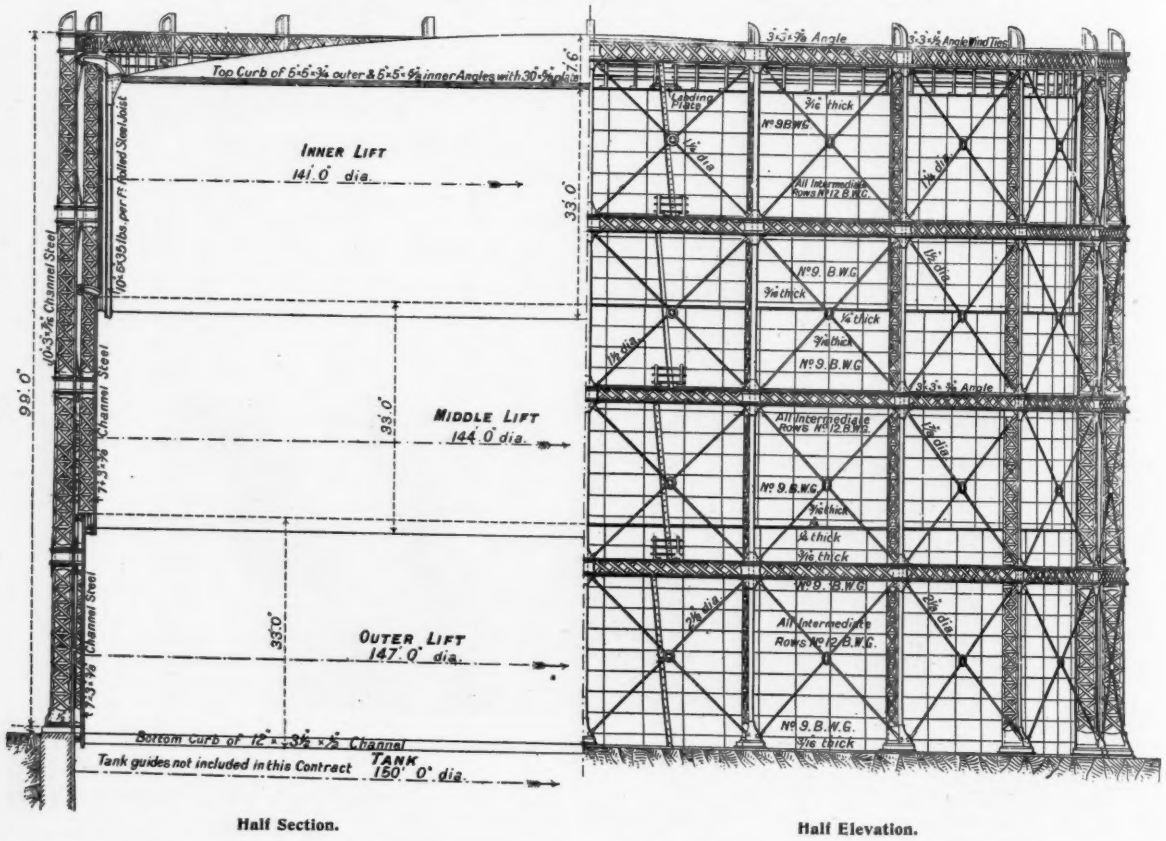
was riveted, thus forming practically a similar channel to the vertical members of the standards. To prevent the lodgment of any rain water in the basin (at the base of the finials), and the consequent corrosion due to its evaporation, the outside plate was carried down at the back, only to $1\frac{1}{2}$ inches off the bottom, thus leaving this space for egress. The bottoms of the standards were filled in with fine concrete and trowelled and pointed on top.

The riveting up of the several lengths of standard and the girder ends with same, were each made off double cages. These were hoisted, and suspended by ropes from blocks attached to the top of the standards; and each joint was completed in turn and then raised to the tier above, with the exception of the top girder junction. This latter, with the fixing of the wind-ties, was done from off the holder top, towards the end of the job. All the rivets throughout on the guide-framing—and there were no bolts—were $\frac{3}{4}$-inch diameter.

The standards were each erected with a slight inclination inwards at the top, to allow for the rollers working tightly even when the holder is fully extended, at which time (owing to the tail weight) the top curbing is apt to be a little contracted in diameter. Between each row of standards, diagonal tie-rods were fixed; the lower ones being $2\frac{1}{8}$ inches, the next $1\frac{7}{8}$ inches, the third $1\frac{1}{4}$ inches, and the top ones $1\frac{1}{4}$ inches in diameter, each secured to the standards with bolts of the same size as the rods themselves, through a flat forged eye passing between the back wing-plate and the heavy angles, as already described. The eyes at the ends of these tie-rods were of sufficient width and thickness to give a sectional area (through the bolt hole) at least equal to that of the tie-rod itself. At the centres of the bays, the four ends were joined together by long screw ends (larger than the rod in each case), which passed through rings, and were secured by a nut and a shaped washer, both inside and outside same. These rings were of channel steel 7 in. by 3 in. by $\frac{1}{2}$ in. and 18 inches internal diameter at the bottom; 6 in. by 3 in. by $\frac{7}{16}$ in. and 15 inches diameter for the second tier; the third and fourth being the same section of channel as the last, but 12 inches diameter inside. Each ring was constructed with the flanges looking outwards. These diagonal ties were (with the exception of the bottom tier, which were not erected till later, to allow of the materials for the holder being passed through between the standards) put in place tentatively, and were pulled up tightly in each case later on, and all made perfectly rigid throughout.

On the north side (away from the main road) a ladder extended from the tank coping to the top box girder, at the centre of a bay between the standards. The ladder is 15 inches wide, and is constructed of 3 in. by $\frac{1}{2}$ in. flat stringers and $\frac{5}{8}$-inch diameter rungs about 10-inch centres; and it is secured to the tank coping at the very bottom through kneed ends (of these stringers) with two $\frac{7}{8}$-inch Lewis bolts. On the top of each intermediate girder a platform 4 ft. 10 in. long and 3 ft. 6 in. wide is erected of $\frac{3}{8}$-inch chequered plate, and is supported by a bracket at each end of 4 in. by 3 in. by $\frac{3}{8}$ in. angle with $\frac{1}{4}$-inch web plate (on both sides of


Vertical Stays (of Inner Lift) 10"×5"×35 lbs. per foot Rolled Steel Joist
INNER LIFT 141' 0" dia.
MIDDLE LIFT 144' 0" dia.
OUTER LIFT 147' 0" dia.
Cradle of 3"×3"×⅜" Steel Angles
All Intermediate Rows of Plates 12 B.W.G.
No 9 B.W.G.
⅜" thick
½" thick
⅝" thick
Quarter Sectional Plan through Inner Lift.
Quarter Plan on Top.


Top Curb of 5"×5"×¾" outer & 5"×5"×⅝" inner Angles with 30"×⅝" plate
INNER LIFT 141' 0" dia.
MIDDLE LIFT 144' 0" dia.
OUTER LIFT 147' 0" dia.
TANK 150' 0" dia.
Bottom Curb of 12"×3½"×⅞" Channel
Tank guides not included in this Contract
10"×5"×35 lbs. per Ft. Rolled Steel Joist
10"×3½"×⅝" Channel Steel
99' 0"
33' 0"
3"×3"×⅜" Angle
3"×3"×⅜" Angle Wind Ties
Landing Plate
No 9 B.W.G.
All Intermediate Rows No 12 B.W.G.
Half Section.
Half Elevation.

the girder), and having a stiffening curb each side along under the edge of the platform of 3½ in. by 3½ in. by ⅜ in. angle. The ladders came up on a slope (of some 2 ft. 6 in. on plan) in each of the four stretches of the height, and were each kneed, bent, and secured to the inside angle bracket carrying the platform. A well-hole 2 feet long was cut out of each platform, to give access to same; and the bottom of the next tier of the ladder was fixed to the chequered platform plate behind the well-hole, with an additional bracket (like the others) at the edge of the well opening, to carry the plate. Each platform is enclosed with three rows of handrailing of 1-inch gas-tubing all round up to the well-hole; and they are carried with five standards 3 feet high of 4 in. by 4 in. by ⅜ in. angle steel—one being at each corner of the platform, and another adjoining the well-hole. Each is kneed and riveted through the chequered plates of, and the angles under, the platform. To give access to the crown of the holder, a landing plate projected from the inner lift, which travelled up 6 inches clear of the inside stringer of the ladder throughout its entire height.

The Work of Constructing the Holder.

During the operations of erecting and riveting the guide-framing, the construction of the gasholder was also being proceeded with. Stout planks were laid across from the tank coping on to the outer purlins of the timber framing over the tank, and on which the entire circle of the bottom curb of the outer lift, to which the two bottom rows of the side sheeting were also attached, was set out. This curbing was of 12 in. by 3½ in. by ½ in. channel steel, in twenty segments, having the ends planed to butt truly and their joints covered with 3 feet long plates of equivalent area to the channel. After this curb was truly set out at the correct radius all round, it was riveted together and the bottom rollers fitted on to work tightly and evenly in the tank guide-rails; the side sheeting being thereafter erected in 6 feet lifts and riveted together, when the entire shell was lowered into the tank water and a further 6 feet row of sheeting added. This process of erecting, riveting, and lowering was continued until the outer lift (to within 6 feet off its full depth of 33 feet) was completed, when it was lowered right down to the bottom, resting on the forty landing stones on the tank bottom. There were forty vertical stays to this lift (one opposite each standard and one midway between same) of 7 in. by 3 in. by ⅜ in. channel; and they were each riveted to the side sheets with ⅝ inch countersunk rivets 8-inch pitch zigzag, and to the bottom curb also with ⅝-inch countersunk rivets. They were, of course, erected and riveted at the same time as the shell.

The lowering was actuated from wooden platforms (carried on hangers) erected purposely on the right hand of each standard, and a 2½-inch strong screw 7 feet long passed through between battens with a ⅝-inch washer plate on the top of same on front of the standards, and having a nut on the top, and secured at the lower end by straps attached through the vertical stays. At signals given by the foreman in charge, the entire twenty nuts were simultaneously given one complete turn by men on the platforms; and this process being repeated as often as required, the entire shell was lowered uniformly into the tank, after which the straps and screws were raised ready for the next stage of lowering.

The sheeting of the outer lift was in eleven tiers, each 3 feet deep in work, and of the following thicknesses: 3-16 inch thick at bottom curb, No. 9 B.W.G. adjoining same, and six rows of No. 12 B.W.G., then No. 9 B.W.G. and 3-16 inch thick next, with the top row of ¼-inch thick sheeting at the dip. The riveting of the $\frac{3}{16}$-inch and the No. 9 sheeting was with ⅝-inch rivets 1¼ inches pitch; and all the No. 12 gauge sheets with ½-inch rivets 1-inch pitch—each seam having a layer of tape 1 inch wide, saturated in red lead, inserted between the lap before riveting up.

The middle lift was next similarly dealt with; the cup being set out in the same way as the bottom curbing, and the bottom rollers of this lift fixed to run tightly in the paths of the outer lift vertical stays. Then the side sheeting to the same depth as before was erected, riveted, and lowered to the landing stones, in exactly the same way as described for the outer lift. There were forty vertical stays of the same section; and the side sheeting in this case also consisted of No. 12 B.W.G. intermediates (five rows only) and one row of No. 9 and then one $\frac{3}{16}$ inch thick next to same at the top and bottom—the remaining rows being ¼-inch thick at dip and cup, or eleven rows in all. The riveting for the several thicknesses of sheets was precisely as stated already for the outer lift, and similarly jointed with the prepared tape.

The cup of the inner lift was next set out, and its bottom rollers attached to run tightly in the paths of the middle lift vertical stays. Then the side sheeting with the vertical stays on same were also similarly built up, riveted, and lowered into the tank. The sheeting to the sides of this inner lift was precisely the same as for the outer lift, only reversed—the $\frac{3}{16}$-inch row being against the top curb and the ¼-inch row adjoining the channel of the cup.

The cups to both the middle and top lifts, and also the dips to the outer and middle lifts, were in twenty segments, truly curved to the proper radius, and were each constructed of 12 in. by 3½ in. by $\frac{7}{16}$ in. channel, having a ¼-inch lute plate 2 feet deep, and stiffened on the outside at the top with a 2 in. by ¾ in. bead. The sides of each lift, and the lute plates, were attached to the channels in each case with ⅝ inch rivets 1¾-inch pitch, and the beading to the lute plate with ½-inch rivets 6-inch pitch, countersunk on the outside. The channels were planed, butted, and joined together with channel covers of equal sectional area, and 3 feet long.

The vertical stays to the inner lift were twenty in number, and were of 10 in. by 5 in. by 35 lbs. per foot rolled steel joists, each riveted to the sides by ⅝-inch rivets 8-inch pitch zigzag, and to the channels of the cupping also by ⅝-inch rivets. The sheeting of the inner lift was carried to its full depth of 33 feet, and the top curb set out all round on same and the vertical stays. The top curb consisted of an outer angle of 5 in. by 5 in. by ¾ in., and an inner angle of 5 in. by 5 in. by ⅝ in. (looking inwards) and 2 feet back to back. They were connected with a ⅝-inch thick plate on the top 30 inches wide, which formed the outer row of crown plates. The angles and this curb plate were joined together with ¾-inch rivets 2-inch pitch in the outer ring and 3-inch pitch in the inner one. The ends of the curb plates were planed, butted, and riveted to a ⅝-inch cover plate 6 inches wide with ¾-inch rivets 2-inch pitch. The joints in the angles broke with those of the curb plate; and they were also planed, butted, and riveted through cover angles of equal sectional area to the curb angles, and 3 feet long. A portion of the curb plate projected beyond the inner angle, to provide for the attachment of the next row of crown sheeting.

This top curb was connected to the vertical stays by means of a ⅜-inch gusset plate 3 ft. 6 in. deep each side of the stay (the inner flange being cut away for this), kneed and carried out to form wings 1 ft. 10½ in. wide at the outer curb. They stretched across the face of the stays, and extended out to the inner curb angle backs. A 5 in. by 3 in. by ½ in. tee, with its web between the gusset plates, was carried up against the inner angle and round under the ⅝-inch curb plate, and joggled under the outer angle, and all riveted with ¾-inch rivets. The flange of the tee (at the bottom end) was carried down on the inside face of the flange of the stay for 6 inches and riveted to same; and the gussets were also secured to the tee, and to the web of the stay, with ¾-inch rivets, and to the outside flange of the vertical stay, and to the outer curb angle, with ⅝-inch rivets. The gusset wings, and the tee, were riveted to the top of the vertical stay at the shop, and the segments of curbing complete were placed on the top of same and fitted. No difficulty was experienced in this fitting together; the entire circle coming out beautifully, and the last segment closing in with little or no trouble.

The crown sheeting was next laid; and this consisted of a ring of $\frac{5}{16}$-inch plates next to the curb plate, followed by one $\frac{3}{16}$-inch and one No. 9 B.W.G., with nine rows of No. 12 B.W.G. intermediates, and one row of No. 9 gauge, which joined up to the centre crown plate ⅜-inch thick and 3 feet in diameter. The riveting of the intermediate rows of the crown sheeting was with ½-inch rivets 1-inch pitch; while the No. 9 gauge and the $\frac{3}{16}$-inch rows had ⅝-inch rivets 1½ pitch to them throughout—the $\frac{5}{16}$ inch thick row being riveted together with ½-inch rivets 1½ inch pitch, and to the ⅝ inch thick curb plate with ⅝-inch rivets at 1¾ inch pitch. All under ½ inch diameter were riveted cold, and with the tape between the lap, and brought up tight with a hand set; while the seams hot riveted were also taped. All the seams were thickly smeared (on the inside) over the joint with red lead.

On the crown there were three manholes fixed—one each over the inlet and the outlet pipes, and the others about equally divided around the circle, adjoining the curb plate. They were each 21 inches diameter in the clear, and consisted of a 6 in. by 2½ in. by $\frac{7}{16}$ in. channel ring standing web upwards (with flanges outwards), and secured to the sheeting through a 2½ in. by ⅜ in. flat stiffening ring inside the crown, with ⅝-inch rivets 2½-inch pitch. The top of the channel ring is covered with a ¼ inch thick plate fastened with ½-inch bolts at 3-inch centres. The manholes over the pipes had chambers under them, extending to, and well sealed in, the tank water, and were 3 ft. 3 in. deep and 8 ft. 6 in. deep on the centre line of the inlet and outlet pipe respectively, from crown to bottom.

The inlet-pipe chamber was 3 ft. 6 in. wide and 5 ft. 6 in. long, with rounded ends (on plan), and was built up of $\frac{3}{16}$-inch plate stiffened at the bottom edge with 2 in. by ⅜ in. beading, and secured to the crown with 2½ in. by 2½ in. by ⅜ in. angle curb. A 12-inch screw-down disc valve actuated from outside the top of the crown was fixed inside this chamber to the crown sheeting, and provided with a cast-iron 12-inch special saddle-piece between the valve branch and the side of the chamber, and also having a cast-iron distance-piece outside under the valve dome, so as to avoid having to break joint on the thin sheets of the crown, if occasion demanded repairing the valve outside. By opening this disc valve, communication between the inlet-pipe and the gasholder proper is made, and so the rising of the inner lift is facilitated; while access to the pipe (from the outside, through the manhole) is made possible by the closing of the valve. By this arrangement, no water-sealing is required, which is a frequent type adopted.

The outlet-pipe chamber is merely a tube tapered from 2 ft. 3 in. diameter at the top to 5 feet diameter at the bottom, constructed of $\frac{3}{16}$-inch plate, and stiffened with a 2 in. by ⅜ in. bead at the bottom edge, and connected with 3 in. by 2½ in. by ⅜ in. angle through the crown sheeting to the channel of the manhole, instead of the flat ring underneath, as in the other cases. Access to the outlet-pipe can be obtained whenever this inner lift is at rest, and no connection between it and the holder proper is needed until the chamber is again unsealed, and the holder brought into use. By these chambers, access is obtainable to the inlet and outlet pipes without losing any of the gas stored in the holder crown. You will recollect I mentioned about guards being fixed on the tops of the inlet and outlet piping inside the tank to prevent these chambers fouling the pipes as the inner lift descended.

Around the top edge of the gasholder crown, a handrailing of two rows of gas-tubing is fixed; the upper one 1¼ inches diameter and 3 ft. 6 in. above the curbing, and the lower one 1 inch diameter and 1 ft. 9 in. above the curb—both being curved to the required radius. They were carried on 4 in. by 4 in. by ⅜ in. tee standards (web inwards), placed about 4 ft. 5 in. centres, which were kneed for 15 inches at the bottom, stiffened with a ⅜-inch web 12 inches up the tee, and fixed to the curb angle and plate. The rails passed through the web of the tees; the upper one being continuous, while the lower one was stopped off at each top carriage and was finished at the ends with cast-iron knobs screwed on.

The landing platform is 6 ft. 10⅜ in. long and 3 ft. 3 in. wide, of ⅜-inch chequered plate, projecting 4 feet from the inner lift, and standing 9 inches above the line of the edge of the curb. Under the sides of this plate a 3½ in. by 3½ in. by ⅜ in. angle is riveted, outside of which a similarly sized angle runs, which is bent down to meet the corner of the shell, and then travels up (to the $\frac{5}{16}$-inch top sheeting) on the curb-plate, to which it is secured. Between these two angles (back to back) a ½-inch web passes; each being riveted to each to form practically Z-shaped brackets to carry the platform plate each end. At each corner of same, similar handrail standards are fixed; and the two rails are carried round inside the platform, and passed through (and capped off outside) the standards at the outer edge of the platform. Since the plate is raised above the crown plates, rainwater is allowed to drain through under the platform to the holder side, and not accumulate against same.

It will be understood that the inner shell was finished before the dips of the other two lifts were put on; and it will be obvious that, working from the tank, the attachment of the projecting dips at the top would have prohibited the cups of the adjoining lifts from being put on. The middle lift was picked up bodily by the same screws as were used for lowering (the process being reversed), and the dip set out, riveted, and the shell lowered, after which the outer lift was similarly treated.

The vertical stays of each lift projected below the cupping for 11 inches, thus providing a means of attachment for the carriages, and also a path for the adjoining rollers. The rollers at the bottom of the outer lift were 12 inches diameter by 4 inches wide on face, with boss 6 inches long and 1 inch flange and solid web, held in double knees ¾ inch thick and 8 inches apart, riveted

through the channel curb. The rollers and carriages at the bottom of the inner and middle lifts were identical; a ½-inch wing plate 17 inches wide being riveted outside the vertical stays, to which (and under the cup) 3 in. by 3 in. by ½ in. angle knees, with ½ inch projecting webs, were attached 10 inches clear apart—the rollers being 10 inches diameter, by 5 inches wide on face, with 7 inches long bosses and 1-inch flange and solid web, and carried between the projecting web plates. As there are only twenty vertical stays to the inner lift, and forty sets of bottom rollers and carriages, 5 in. by 3 in. by ½ in. tees were riveted intermediately to the bottom tier of the side sheeting to stiffen same, and were carried down below the cup for the attachment of the ½-inch wing plate similarly to the main vertical stays.

All that now remained to be done was to attach the top rollers and carriages to the dips and the curbing. This was done in turn—those of the outer shell being followed by the middle, and then the inner, lift; and all rollers were inserted tightly to run in the channel-guides up the standard face. The outer lift top rollers are 12 inches diameter by 4 inches wide on face, with 6 inches long bosses and 1 inch flange, solid web, and four arms, and are carried between two ½-inch plates, with 7 in. by 4 in. by ⅝ in. angles 12 inches deep, joining same to the side sheeting. The middle lift top rollers are 17 inches diameter by 4 inches face and 6 inches boss, with 1¼-inch flange and four 1-inch arms and hollow webs, and are carried by shaped brackets consisting of two ½-inch plates 8 inches apart, and having 3 in. by 3 in. by ½ in. angles riveted round the edge of same springing from, and secured to, the top of the dip channel. The cheeks were kept in place with two cast-iron distance-pieces having 1-inch rivets through same, and at foot (against dipping) with a piece of 8 in. by 3½ in. by ½ in. channel riveted to the cheeks and angles, also to the dip, and turned down at the front to resist "push." The inner lift top rollers are 24 inches diameter by 4 inches face and 6 inches boss, with 1½-inch flange and six 1-inch arms and hollow webs, and are carried by swan-neck brackets consisting of two ½-inch plates 8 inches apart, riveted at the base by 6 in. by 4 in. by ⅝ in. angles 3 feet long to the crown-plates. Riveted around the edges of the cheeks, and joggled over the 6 in. by 4 in. junction angles, are 3 in. by 3 in. by ½ in. angles, across the backs of which (on the top of the carriages) are five pairs of 2½ in. by ⅜ in. flat lattices.

The axles for all rollers had phospher bronze sleeves, 8 inches long, cast on the black steel pins at the centre of their lengths; and they were reduced at the ends where they went through the cheeks, and had gun-metal caps at each end to cover the screws and protect them from corrosion. The axles for the top rollers of the inner lift were 2 inches diameter, with 1⅜-inch ends; the phosphor bronze sleeves being 8 inches long by $\frac{5}{16}$-inch thick. Those for the middle-lift top rollers were 1¾ inches with 1¼-inch ends and ¼-inch sleeve; while the axles for all the other rollers were 1½ inches diameter and 1-inch ends, with ¼-inch sleeve. Between the roller bosses and the insides of the cheeks there was a space of 1 inch each side; and this was provided to allow for any lateral adjustment, with loose washers as required, if the roller should happen not to be quite central with the rolling-paths. Slots were cut in the cheeks to allow for wedging up the axle when set, after which large washers were put under the gun-metal caps, to prevent these wedges from falling out should they work loose at any time.

The entire seams inside of each lift were given a coat of thick red lead, as was also the whole of the cupping of the middle and inner lifts; and I may here state that these latter were each filled with water and tested for 24 hours before being lowered into the tank, and proved perfectly water-tight in each case. The entire outside of each shell was given one coat of creamy white Torbay paint prior to lowering; the remaining two cream coats being applied while it was being inflated for purposes of testing. The guide-framing entire had also three coats of Torbay paint, but of the natural reddish brown colour. This was applied from swinging cradles.

Testing, Working, Cost, Etc.

The gasholder was twice fully inflated, it taking one week each time to raise it; and while it was being extended, the seams as they were ascending through the tank water were carefully watched for bubbles. Each seam was afterwards brushed over with soapy water (over both the sides and the crown), and any leakages caulked up at once; but there were none of any moment. Owing also to the care that was taken during erection, by an extensive use of props against the sheeting, there were no buckles nor misshapen portions in the lifts or on the crown. The pressures thrown by the gasholder were as follows: Inner lift alone, 41-10ths; inner and middle, 67-10ths; all three, 90-10ths.

An anti-freezing apparatus was also fixed consisting of a semi-circle of 1-inch steam-tubing laid outside of the base stones, and with two 1-inch uprights at two opposite standards, to which they were clipped. They stood, one 16 feet and the other 32 feet, above the top of the tank at these places; and at their top ends 1-inch armoured flexible tubing was attached with brass unions. On the dip of both the middle and outer lifts at these two opposite points brass injectors to circulate the water in the cups were fixed, and the flexible tubing was coupled to same, with bra s unions, by short pieces of 1-inch steam-tube; the flexible tubing in each case being long enough to reach the cups at whatever height they might be.

The time occupied by the construction of the tank and erection of the holder was some 2½ years; but it must be explained that there was considerable delay during the tank construction, by reason of exigencies of the weather, shortage of materials at times, extra work, and disputes. The holder took one year to erect complete; the erection and riveting of the guide-framing entire occupying some six months, the outer and middle lifts about six weeks each, and the inner lift with crown sheeting three months. There is about 525 tons of mild steel in the job; 230 tons being in the guide-framing, while the thin sheeting alone takes up some 140 tons.

The total amount actually paid to the tank contractors was £7327 5s. 10d.; and the cost of the holder was £9630 1s. 11d., though in considering this there must be borne in mind the higher cost involved through constructing over water. The entire gasholder and tank cost a total of £16,957 7s. 9d., which works out at £11 6s. 1d. per 1000 cubic feet of gas stored, which I think will be agreed is most moderate for a gasholder of this capacity.

It only remains for me to add that the Contractors for the tank complete were Messrs. Matcham and Co., Limited, of Plymouth; and the gasholder was constructed and erected by Messrs. Clayton, Sons, and Co., Limited, of Leeds. The Engineers responsible for the design and superintendence were Messrs Stevenson and Burstal, of Parliament Street, S.W.

[Through the courtesy of the Engineers and the Contractors for the gasholder, Mr. Campbell was enabled to exhibit the drawings relating to the work and mounted photographs of the holder during construction and finished—among them being those now reproduced. He also handed round a large number of unmounted photographs which he had himself taken.]

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

Visit to the Paisley Gas-Works.

The members of the Western District of the Scottish Junior Gas Association, to the number of about sixty, last Saturday paid a visit to the Paisley Corporation Gas-Works, where they were received by Mr. G. R. Hislop, the Engineer, and by him, his son Mr. F. Hislop, and his Assistant Mr. A. S. Nisbet, were conducted over the works.

Gas was introduced into Paisley under an Act passed in 1823; the works, built upon the site of the present works, being ready for use in March, 1824. They have been managed since May, 1865, by Mr. Hislop, in whose hands they have been so renovated that all now remaining that was in existence in 1865 is a coal-store, which is under condemnation. All the coal in Paisley is stored under cover; provision being made for housing 7000 tons. It is an indication of the orderly conduct of the works that waggons coming in with coal are forthwith, by day or night, emptied and returned; and the Corporation, having never had to pay demurrage charges to railway companies, have declined to join in the movement upon this subject. Coal is brought in upon a high-level railway siding, and emptied by hand. It is again loaded by hand into side-tipping hutches, every one of which, as it passes on to an elevating hoist, is automatically weighed and the weight recorded. The hoist, as is the case with nearly all the other machinery, is driven by electricity, which is generated in the works. The coal is tipped into the hopper of the breaker, and, after breaking, is elevated and conveyed by a gravity bucket conveyor. These portions of the retort-house plant are in duplicate, and are so arranged that the whole of the retort-house can be served by either set. There are 336 retorts, in settings of eights—all of them served by De Brouwer charging machines. The discharging is done by hand, and the hot coke is wheeled outside and quenched in enclosed wooden shafts placed against the wall, by which the steam and vapour are carried off. In a corner of the retort-house there is an oil-gas plant, originally of the design of the second Peebles process, but so varied by Mr. Hislop as to now contain very few of the features of the patent. It is capable of producing about 100,000 cubic feet of gas per day. The gas is condensed by itself (the condensation being one of the characteristics of the Peebles processes), and is then introduced into the coal gas.

From the retort-house, the company were taken into the sulphate-house, in which there are two plants, erected by the Chemical Engineering Company. One of these was at work, concentrating the liquor from 15° to 17° Twaddel, for which there is a local demand. Beside the sulphate-house is the plant in which spent liquor is purified by the Radcliffe process, the effluent from which was shown to be sufficiently clarified to be fit for discharge into town sewers. As matter of fact, it is first used for quenching coke. The firing of steam-boilers by the shallow regenerative system was then looked at, as were also the exhauster-house and the meter-house. There are three sets of reciprocating exhausters, and a double rotary set. In the meter-house there are two meters—one to pass 100,000 cubic feet per hour, by Messrs. R. Laidlaw and Son, and the other, of 150,000 cubic feet capacity, by Messrs. James Milne and Son. The process of revivifying spent lime was shown at work. There are ten ovens, several of which were under heat; the lime they were dealing with having been in use for eight years, and revivified many times. The quantity

of lime required in the works is about 1500 tons a year. Revivification costs about half what fresh lime would; and there is the additional saving in there being no waste to cart away, the cost of which in Paisley would be considerable. There are six purifier-boxes, 36 feet by 40 feet. Both lime and oxide are used; and the material is conveyed to and from the purifiers by a Temperley transporter. As is well known, Mr. Hislop uses lime in one thick bed, and sends the gas down through it.

A visit was then paid to the electric station, when a suction-gas plant, to produce Dowson gas, was found in one wing of the building, and, in the other duplicate plant consisting of "National" gas-engines, of 71 B.H.P. each, coupled to dynamos of the Witton type. The Temperley transporter which is used for handling the coke in the yard was shown at work; and comment was made regarding the unbroken condition in which it left the coke. There is a large bing at present in the yard; but it was explained that it will all be taken up locally. The gasholders are four in number, one of 1,250,000 feet capacity, one of 750,000 feet, and two of 170,000 feet each. The governor-house, the scrubbers and washers, and the workmen's bathroom—a spacious apartment, fitted with every convenience, and with a supply of hot and cold water—were inspected, after which the company were invited to the board-room in the office at the works, a building which, by the way, was Mr. Hislop's residence for nearly forty years, and which has since been converted into offices.

Mr. HISLOP expressed the great pleasure he had in welcoming the members. After alluding to the advantages enjoyed by the young men of the present day, he said close application to study was the avenue to success. An important element in the ideal gas manager was the cultivation of method and order in the conduct of his work. The basis upon which a gas manager must stand to-day was one of a concrete nature, compounded of those elements which constituted endurance and reliability to carry a burden of great and ever-increasing responsibility, which the advance of time and science imposed upon him. As in the physical and chemical laboratory of Nature there was incessant change and progress, so the human mind must advance in the knowledge of those laws which so changed and governed matter, and apply them to the purposes of life, and especially in his own particular sphere; and to fulfil these conditions, the gas engineer of to-day required a wider knowledge of those laws than most other professions. The facilities for the acquisition of knowledge in every department of gas engineering and management were liberally furnished through the medium of the Press. The gas journals rendered a service to the profession which was of great value, recording as they did the flow of knowledge upon every phase of their intricate business. Every gas-works possessed its own peculiar features, and so the inspection of various works was of considerable educational value. At Paisley, the output of gas at present amounted to about 475 million cubic feet per annum, and the sale to some 6 per cent. less. The annual increase was about 4 per cent. only, which was but half the rate prior to the introduction of electric light, and accounted for an annual deficiency to-day of 135 million cubic feet. Of coal and its equivalent, they carbonized some 44,000 tons per annum; and for the current year they were getting about 10,800 cubic feet per ton, working on four-hour charges of 2½ cwt. The quality of the gas supplied was fully 20-candle power. This required a small proportion of cannel coal throughout the year, with the addition of some oil gas during the winter months. No doubt they would reduce the illuminating power, as time went on; but he thought it was a dangerous thing to do quickly. About a candle a year was what he had accomplished. It might be interesting to refer to the liberal policy adopted by the Corporation in April, 1904, of supplying all cooking appliances free of hire, and fitted free (as in the case of meters). The cost of this to the Corporation amounted to about 4½d. per 1000 cubic feet—the sum required to cover interest, sinking fund, and repairs. Consumers of gas for cooking were thus placed upon equal terms with users for power and for commercial purposes—viz., 1s. 10½d. per 1000 cubic feet (the public rate being 2s. 3d.). For the latter two purposes, upwards of 30 million cubic feet of gas per annum were required. Out of these rates, from 2½d. to 3d. per 1000 cubic feet was set aside annually for public improvements, &c. Consequently, to this extent at least, they were handicapped in their comparison with other towns, since figures showed that the public rate should be 2s. per 1000 cubic feet.

The PRESIDENT (Mr. A. H. Whitelaw, of Glasgow) proposed a vote of thanks to Mr. Hislop, to Mr. Nisbet, to the Corporation of Paisley, and to the Gas Committee for the pleasant afternoon they had had. They had seen a works which were thoroughly up to date in every sense of the term. He thought the outstanding feature of the afternoon had been the capital way in which Mr. Hislop had drawn their attention to the various parts of the works. From beginning to end, everything had been made clear to them. Mr. Hislop was an engineer in every sense—he was a gas engineer, an electrical engineer, and undoubtedly he was a civil engineer. In the design of the works he had shown much broad-mindedness. He did not despise electricity, but had introduced it into his works for power purposes; and he had shown that he was saving money by it. He was not content to use gaseous firing for retorts only, but had extended it also to his boilers. Everything was done in a liberal way in the works—in a way that was benefiting the public of Paisley, the works, and everybody concerned.

The motion was adopted with great cordiality.

Mr. HISLOP said it was sufficient thanks to him that they were satisfied with their visit. He might say there were 26 motors in the works. His purpose was to endeavour to know what could be done; and he put in electricity for experimental purposes. It was the same with suction gas. If anyone wanted to put in a suction-gas plant, he could advise him.

The visitors were then driven to the meter and stove repairing workshops, in the centre of the town. They are in a two-storey brick building, 40 feet in length by 26 feet wide, which is heated by a hot-water system. Mr. Hislop said the cost of heating the whole place in this way was £7 a year. Beside the office there is a display of gas stoves and fires for exhibition purposes; but the Corporation do not deal in such appliances.

Afterwards tea was served in Gibson's Restaurant, at which Bailie Harper, the Convener of the Gas Committee, presided. The President, in the name of the Association, thanked the Corporation for their hospitality.

REGISTER OF PATENTS.

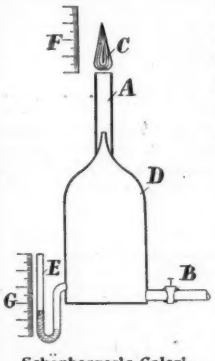
Determining the Calorific Value of Gases.

SCHÖNBERGER, F. P., of Sagn, near Coblenz.

No. 2314; Feb. 1, 1908.

This method for determining the calorific value of gases by burning the latter in an open flame is based upon the fact that, in the case of industrial gases, the speed at which the flame moves in the current of gas in a direction opposite to that of the current (called the "speed of ignition") depends in a specific manner on the calorific value of the gas.

The device, shown diagrammatically, consists substantially of a burner A, the regulating valve B, a gasholder D, a gauge-tube E with graduation G, and a scale F for measuring the flame C. If the pressure in the gas-pipe is above atmospheric pressure (and this will generally be the case, the patentee says, in industrial plants and works), the device may be connected directly with the gas-pipes; otherwise, means will have to be provided between the gas-pipe and apparatus for increasing the pressure of the gas.



Schönberger's Calorimeter.

For adjusting the apparatus independently of the gas-pressure—that is, for bringing it into the condition in which it is calibrated—the speed of ignition is employed. With the aid of the regulating valve, the flame is adjusted in such a manner that it rises slightly above the burner. Under such conditions, the speed of ignition is equal to the speed of escape of the gas. Now as the speed of ignition and the calorific value are in a given relation to each other, there will correspond to each speed of escape a given calorific value. However, to each speed of escape there corresponds also a given pressure in the holder, which may be read on the gauge E; and thus the calorific value of the gas may be directly noted on the gauge scale.

Further, to each speed of escape there corresponds a given length of flame, which may be read on the scale F. On this scale likewise, therefore, the calorific value of the gas may be noted. The various calorific values corresponding to the varying pressure at the gauge-tube and the various lengths of the flame must be found by calibrating the apparatus.

By gradually opening the regulating valve—thus increasing the speed of escape of the gas—the flame may also be caused to rise correspondingly from the burner until at last, overcome by the speed of escape, it goes out, and at that moment the scales are read.

Making Fire-Bricks.

ALBON, I., of Plaistow, Essex, and PARKER, W. R., of Bexley Heath, Kent.

No. 24,325; Nov. 12, 1908.

This so-called "invention" consists in grinding up the refuse from fire-bricks as originally made of fire-clay, and in then mixing the ground material with certain proportions of new finely-ground fire-clay and sand, and mixing the whole together with water.

The steps of the process are set out in detail: A quantity of the old fire-bricks are placed in a mortar pan and ground up until they form a fine powder. Finely-ground fire-clay is then added in the proportion of about 1 in 8 by volume of the fire-brick powder and fine sand, also in the proportion of about 1 in 8 by volume of the fire-brick powder. When thoroughly mixed together, water is added and the grinding continued until the mass is of the consistency of a stiff paste. This material is then taken and made up into bricks, preferably by hand, but anyway without any great amount of pressure. The bricks so made are dried and burnt in a kiln—generally requiring from 30 to 50 hours under full fire.

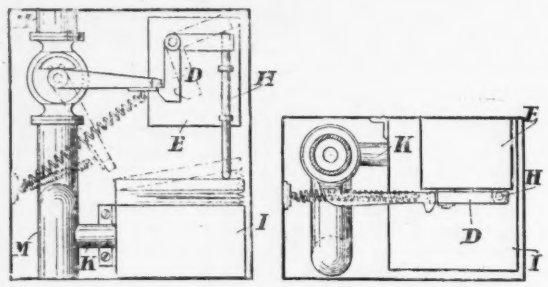
Cutting-Off the Supply of Gas.

SCHÄFER, H., of Elberfeld, Germany.

No. 1915; Jan. 28, 1908.

This invention relates to a device fitted to gas-pipes by which the supply of gas to various rooms can be shut off, under certain conditions, from any desired place of consumption. The device employed is based upon the fact that a pair of bellows communicating by a branch pipe

with the house main influences a cock, and eventually closes it, when the pressure in the main pipe increases in consequence of the cocks of one or more service-pipes being closed.



Schafer's Gas-Cock Closer.

In a casing through which the house main M is led, a cock is inserted, the handle of which rests on a projection on the bell-crank-lever D—revolubly mounted on a pivot on the plate E. On the plate, two collars are fixed in which a rod H is guided—resting at its lower end on a loaded pair of bellows I connected by a pipe K with the main pipe. With the outer end of the handle of the cock a strong spring is connected, which is fastened at the other end to the casing.

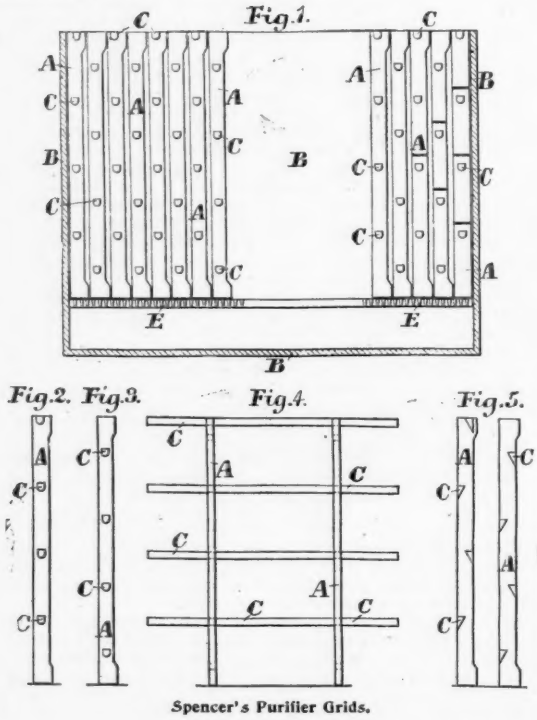
As soon as the service-pipe is shut off from the main pipe and ceases to supply gas, the pressure in the main pipe rises and, consequently, also that on the bellows; and it somewhat inflates the latter. By loading the bellows (as mentioned above), the complete inflation of the bellows, and, consequently, the release of the cock from the control of the bellows, is effected, but not until the cocks of all the service-pipes which branch off from the main pipe have been closed. Consequently, on the supply of gas to the service-pipes being wholly interrupted the bellows rise; and their motion is transmitted to the rod H, which releases the angle-lever D, so that the support of the lever E is withdrawn and the cock closed by the spring.

Grids for Gas-Purifiers.

Spencer, W., of Elland, Yorks.

No. 3649; Feb. 18, 1908.

This invention relates to grids of the type described in patent No. 1576 of 1905; the patentee's object being the construction and arrangement of single vertical hurdles or grids placed side by side whereby a break-joint arrangement of bars for supporting the purifying material is obtained.



Spencer's Purifier Grids.

Fig. 1 is a sectional elevation of a purifier-box showing the new construction of hurdle or grid. Figs. 2 and 3 are end views of a pair of hurdles or grids intended to be arranged in a series to form the grid. Fig. 4 is a front view of the hurdle shown at fig. 2. Fig. 5 is a modification of figs. 2 and 3.

Each hurdle or grid is formed of narrow side bars or frames A (with square ends) of a length to suit the depth of the purifier B. These side bars contain a vertical row of triangular D-shaped bars C, for supporting the purifying material. The hurdles are employed in pairs, with the bars C of one hurdle in a different plane to the corresponding bars in the next hurdle, so that when a series of pairs are arranged within the purifier, each bar in each hurdle is centrally opposite the space between the bars of the adjacent hurdles in either a vertical or horizontal direction—"thus setting up a series of horizontal and oblique rows of bars for supporting the purifying mass in horizontal layers of even depth, and reducing to a minimum the space between each vertical row of bars and the tendency to settle or vary the density at these points."

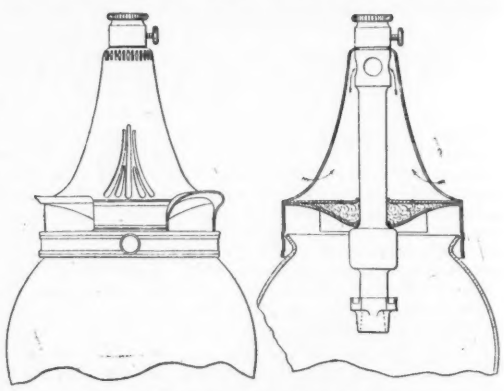
Instead of arranging the bars C of each hurdle in vertical alignment as at figs. 1, 2, 3, and 4, they may be secured in a zig-zag line within their narrow side pieces or frames A, as in fig. 5, by letting them in to corresponding recesses formed in both edges of the frames—the recess in one edge being opposite the space between two recesses in the other edge.

Inverted Incandescent Gas-Burners.

Francis, A. S., of Farringdon Road, E.C.

No. 2800; Feb. 7, 1908.

This invention relates to incandescent gas-burners comprising a straight depending bunsen tube enclosed for the greater part of its length in a conical or domed casing, closed at the bottom by a disc which fits around the burner-tube and acts as a deflector for the products of combustion, which are emitted through apertures in a deep globe-ring. It was previously proposed in one instance to provide such an emission aperture at one side of the ring and air inlet holes in the hood at a point about diametrically opposite to the emission aperture—the hood being otherwise closed. Also it was proposed in another instance to make air-holes all round the top and bottom of the hood, and form a single emission aperture in the globe-ring, so that the products of combustion were emitted at one side only. The present invention, however, provides emission apertures, preferably hooded, at various points in the ring, and the lower set of grouped openings are so disposed that they are intermediate neighbouring emission openings in the ring and therefore quite clear of the products of combustion.



Francis's Inverted Incandescent Lamp.

According to the construction illustrated, the air entry or mixing-chamber and the bunsen tube are enclosed by a casing of more or less conical form. Entry of air is provided for by a number of apertures near the lower end of the chamber and at or near the top, whereby a clear way through is ensured, so that the supply of pure cold air to the mixing-chamber is constant and in no wise throttled. The lower apertures may, if desired, be provided with small hoods or deflectors to direct the currents of air into the air-chamber and prevent the entry of the hot ascending products of combustion; and the casing may be provided with baffle-plates to cause the air to take a circuitous route and facilitate the deposit of dust. A flat or dished metal plate is fitted above the deflector (fitting externally tightly against the inner periphery at the base of the casing and internally against the bunsen tube); and the space between the plate and the deflector is filled with non-conducting material—asbestos or the like.

Pressure Regulators for Gas-Burners.

Broad, C. C., of Great Malvern.

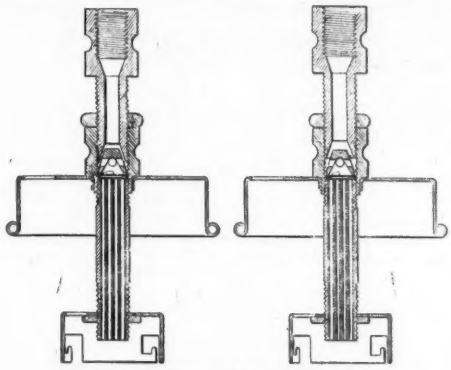
No. 4073; Feb. 24, 1908.

These pressure regulators are primarily for use in connection with incandescent burners for burning gases formed by a mixture of atmospheric air and vaporized hydrocarbon in contact with an incandescent mantle, but are also applicable to incandescent and other burners using ordinary town or coal gas.

Hitherto provision has been made for regulating the gas pressure at the burner by interposing in the supply pipe discs of wire gauze which serve as baffles to the flow of gas and reduce the pressure more or less, according to the number employed. The present invention provides, in substitution of the discs, a mechanical pressure-regulating device, which is combined with, or forms part of, the gas-supply pipe of the burner, and can be operated for altering or regulating the pressure of gas at the burner without disassembling any of the parts.

In the application of the invention to an inverted burner of the multi-tubular type (p. 629), in which the gaseous mixture is delivered into the mantle through a cluster of small tubes, the upper end of the induction pipe leading to the tubes is formed into a socket, the interior of which is fitted with a cone or cap having a solid crown or top, but provided around its sides with ports or perforations leading from the socket into the interior of the induction tube and enabling gas to pass into the induction tube and thence to the burner.

The socket and cone constitute the fixed or standing element of the pressure-regulating device, while the other element is provided by a specially-constructed pipe, adapted to adjust the pressure at which the mixture shall pass into the induction tube by a screw action. Thus the socket end of the induction tube is screwed internally and the lower portion of the supply or inlet pipe is similarly wormed, so that it may



Broad's Gas-Burner Pressure-Regulator.

be screwed into the socket and thus effect the connection between the inlet pipe and burner induction tube. Further, the lower end of the inlet pipe is coned or flared and opposed to the perforated cap at the upper termination of the induction tube; the arrangement being such that an annular and adjustable gas-passage is provided between the coned or flared extremity of the inlet pipe and the coned and perforated cap at the upper end of the induction tube. Thus, by rotating the tube and burner or by screwing the socket on to or off the inlet pipe, the size of the annular passage is decreased or increased so as to oppose proportionally more or less resistance to the flow of the mixture, and thus regulate the pressure at which it is admitted to the induction tube.

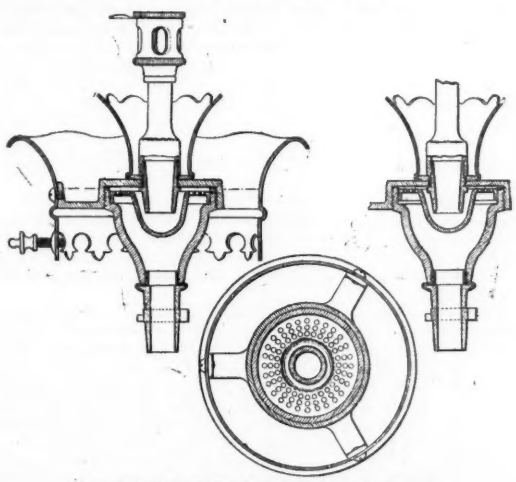
Incandescent Gas-Burners.

DARWIN, H., of Gravelly Hill, near Birmingham.

No. 5626; March 13, 1908.

These downward or inverted atmospheric burners are of the kind wherein a mixing and expansion chamber is interposed between the gas and air induction tube and the burner-nozzle; the invention consisting in the application to, or combination with, the expansion chambers, of an automatic pressure-regulating device of the floating disc type, and in the arrangement of the regulating float in such a manner that, in addition to being influenced by the pressure of the incoming gas and air mixture in the upper part of the chamber, it is also oppositely influenced by the expansion of the mixture within the lower part of the chamber and by the back-pressure which it sets up as the mixture passes from the chamber into the restricted burner-nozzle.

Further, the regulating device serves as an auxiliary mixing device—providing "simple but effective means" for "realizing two effects which are essential to the production of a brilliant light and economy in gas consumption:" (1) The thorough incorporation of the supplies of gas and atmospheric air, and the delivery of the mixture thereby produced to the burner-nozzle or to the point of ignition under conditions which will ensure its perfect combustion and the attainment of a light of high illuminating efficiency; and (2) the automatic regulation of the pressure of the mixture at the burner-nozzle—that is to say, the preservation of a constant or even mixture pressure at the nozzle under all conditions of service and irrespective of any variations of the supply pressure in the mains, "thereby obviating any possibility of the burner-nozzle becoming choked or blocked through being supplied with more mixture than can be effectively consumed."



Darwin's Inverted Incandescent Gas-Burner.

In the burner shown, the regulating and auxiliary mixing device consists essentially of a floating and perforated diaphragm or float located within a mixing and expansion chamber in free suspension between the gas inlet and the burner-nozzle, so that it may be raised or lowered by the pressure variations of the opposite forces to which it is subjected, and thus serve to automatically vary or alter the relative sizes of the gas intake and delivery passages in proportion to the rise or fall of the pressure at the mains. Thus, when the service pressure is relatively high, the regulating float is depressed in opposition to the back-pressure or reactions of the mixture below the float, and the intake passage is increased in size, while the delivery passage is proportionally reduced. It thus reduces the pressure at which the mixture can pass to the burner-nozzle, whereas when the service pressure falls the position of the floating regulator is altered by the back-pressure below it, so as to reduce the area of the intake passage and increase the area of the delivery passage, thereby admitting of a freer flow of mixture to such a degree as may be necessary for preserving the desired pressure at the nozzle.

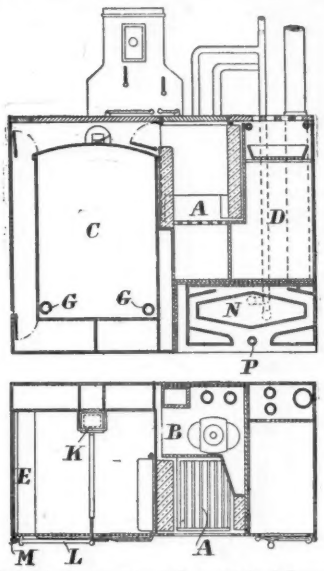
The first illustration represents, in transverse vertical section, an inverted incandescent burner embodying the improvements. In this view, the combined mixing device and automatic pressure regulator is shown in the position it assumes when the burner is out of use. The second similar view shows the mixing and pressure regulating device in floating suspension between the inlet and outlet of the burner when the latter is in service.

Combined Gas and Coal Range.

POTTERTON, T., of Balham, S.W.

No. 7582; April 6, 1908.

The range, shown in longitudinal section and plan, is formed as a portable ordinary kitchen range having a coal-fire A towards the centre, with a boiler B at the back in connection with it. On the one side is arranged the oven C, with flues for use in connection with the coal-fire; and on the other side is a hot closet D. The whole is covered with the usual hot-plate. The flues around the oven are fitted with dampers operated by the handles from the outside, so that these can be closed and the flues rendered practically air-tight when the oven is heated by gas.



Potterton's Combined Gas and Coal Range.

In the bottom of the oven C are arranged gas-burners G in such a manner that the gas cannot be turned on without at the same time ensuring the necessary supply of air for the consumption of the gas. To effect this, small doors below are opened in order to permit elongated arms of the gas-cock handle to be turned on to supply gas to the burner; but if the doors be closed, they automatically cut off the gas by bearing against the elongated arms. At the top of the oven is a sliding damper K, to permit the products of combustion to escape from the oven itself to the ordinary chimney flue. The handle of the damper is provided with a bar L (extending at right angles), the end of which is of such length as to engage the handle of the cock of the main gas supply M when this is turned off so as to necessitate the damper K being operated before the main gas supply can be turned on.

The boiler N to be heated by gas is arranged below the fire A and the hot closet D, and is preferably of double-cone shape, having side bottom pockets connected with the main boiler by pipes. The boiler is heated by the gas-burner P, the heat impinging on the lower part of the main boiler N being deflected along its bottom, sides, and on to the tops of the side pockets. The hot-water supply and return pipes from the coal-fire boiler are joined to the similar pipes from the gas-fire boiler at the top of the range, and thus communicate by single pipes with the hot-water cistern.

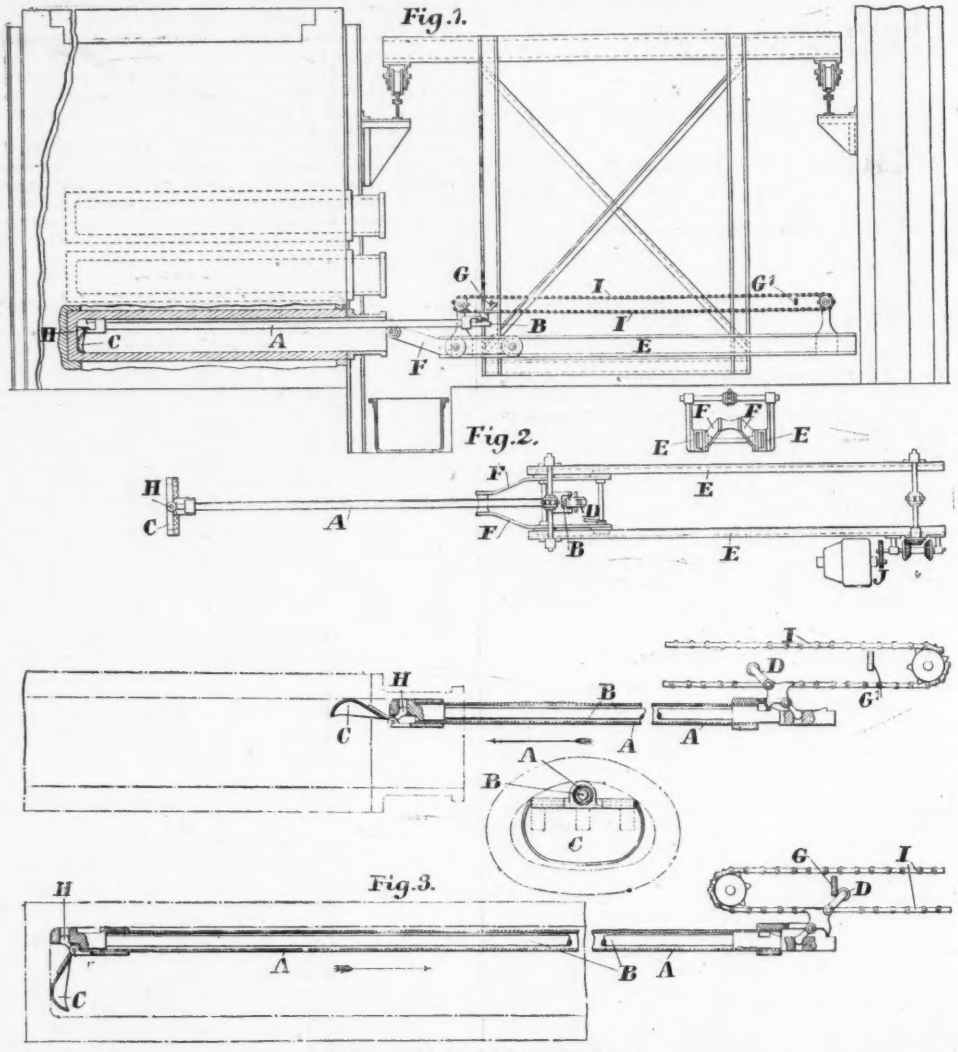
The top of the range has on it gas-boiler burners, the pipe connections of which are separately hinged, so that they can be separately used or can be lifted upwards out of the way when the top of the range is to be employed as a hot-plate with a coal-fire.

Discharging Gas-Retorts.

JOHNSON, J. Y.; a communication from the Badische Anilin und Soda Fabrik, of Ludwigshafen-on-Rhine.

No. 5673; March 13, 1908.

This invention relates to apparatus for withdrawing the charge from horizontal retorts which can only be opened at one end—apparatus in which the part that enters the retort comprises a scoop, rake, shovel, or blade pivoted at one end of a rod, operated from outside the retort, so that the scoop can be brought approximately into line with the rod for insertion into the retort, and can be turned and held down for withdrawing the charge. Apparatus of this type was described in patent No. 565 of 1870; but such apparatus is said not to be satisfactory, "because the mechanism which operates the scoop is very complicated,



A German Horizontal Retort Discharger.

and the parts inside the retorts are liable to become clogged by part of the charge and are exposed to the direct heat of the charge, and no means are provided which enable part of the charge only to be withdrawn when so desired."

Fig. 1 is an elevation (partly in sections) showing the scoop inserted as far as the inner end of the retort and ready to withdraw the charge. Fig. 2 is a plan showing an electric motor and reversing mechanism for operating the apparatus (the chain omitted). Fig. 3 shows (drawn to a larger scale) the apparatus actually used in withdrawing the charge—the scoop in the two positions it assumes, according to the direction in which the chain is moving.

A is a tube inside which the rod B slides. C is the scoop hinged to an attachment fixed to the tube A, and with a projecting lever H, the rounded end of which fits in a recess or hole in an attachment fixed to the bar B so as to cause the scoop to be turned up or down, when the bar is moved in one or the other direction relatively to the tube A. D is a lever, pivoted to the attachment fixed to the rear end of the tube A, and also to the chain I; the rounded end of the lever D below the pivot fitting in a recess or hole in an attachment fixed to the rear end of the rod B, so that, when the portion of the chain I to which the lever is pivoted is moved in one direction, the lever tends to move the rod in the other direction until this motion of the rod relatively to the tube is prevented by one or other of the arms of the lever coming into engagement with the respective notches in the attachment to the rod. Then the rod and the tube are moved together in the same direction as the portion of the chain to which the lever is pivoted.

In the position of the lever shown in the top part of fig. 3, the chain I is moving the rod B and tube A into the retort—the scoop C being horizontal or nearly so; while in the position shown in the lower part the direction of motion of the chain has been reversed, and the chain has been moved so far that the lever has been thrown over and the rod thereby moved relatively to the tube and the scoop brought into a vertical position. On the continued motion of the chain, the scoop will be withdrawn from the retort, pulling the charge with it.

E is part of the framework supporting the actual discharging apparatus, and F is a support (preferably provided with a roller) for the tube A. G G¹ are stops connected with the frame C, in any suitable way, against which the lever D can strike and be thrown over. With the stops as in the illustration, the lever D will be thrown over at each end of the complete stroke; but by moving them, or either of them, the lever can be caused to be thrown over at any intermediate position, according to the proportion of charge desired to be withdrawn.

In apparatus according to this invention, the actual discharging apparatus is passed into the retort above the charge, and only the scoop is brought into contact with the hot charge in discharging; the lever or other device used for turning down the scoop being attached to the back of the scoop, so as to be protected from the direct heat of the charge and to prevent any part of the charge from getting between, and clogging, the working parts. The lever D is connected to the chain, so that reversal of motion of the chain causes the scoop to be turned up or down, at any position of the scoop relatively to the retort.

APPLICATIONS FOR LETTERS PATENT.

3634.—Darwin, H., "Incandescent lamps." Feb. 15.
3677.—Ries, H., "Quenching and conveying coke." Feb. 15.
3678.—Ofenbau, G. m. b. H., "Actuating the doors of retorts," Feb. 15.
3786.—Chatterton, J., and Coventry, W., "Burners and mantles." Feb. 16.
3809.—Green, F. J., "Mantles." Feb. 16.
3859.—Turner, A., "Inverted burners." Feb. 16.
3866.—Darwin, H., "Incandescent burners." Feb. 17.
3918-9.—Hutchins, T. W. S., "Gas-producers." Feb. 17.
3941.—Leopold, O., "Lighting and extinguishing gas-lamps." Feb. 17.
3948.—Küttner, E. W., "Inverted gas-lamps." Feb. 17.
3985.—Dempster, J., "Rotary blowers or exhausters." Feb. 18.
4016.—Long, F. C., "Temperature-indicating apparatus." Feb. 18.
4057.—Peake, W. S., "Pyrometers." Feb. 19.
4090.—Walker, R., Page, J. C., J. W., J. T., & F. W., and Fairfield, H., "Rotary engines, turbines, pumps, and blowers." Feb. 19.
4139.—Gould, G. P., and Rose, R., "Gas firelighters." Feb. 19.
4196.—Chick, P., "Joining gas and water mains." Feb. 20.
4199.—Boyle, W. R., "Igniting gas-jets." Feb. 20.
4201.—Peebles and Co., Ltd., and Waddell, A., "Automatic three-way valve." Feb. 20.
4212.—Candy, F., "Purification of water." Feb. 20.
4218.—Sparks, E., "Lighting and extinguishing gas-burners." Feb. 20.
4262.—Kozminski, S., "Gas-meters." Feb. 20.

A Local Government Board inquiry was opened at Derry last week relative to an application by the Corporation for a loan of £3800 for the construction of a reservoir and the relaying of water-mains; and also with reference to a complaint by several large ratepayers that the Corporation had made default in supplying the city with water. After several witnesses had been heard, the inquiry was adjourned.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Railway Demurrage and Siding Rent, &c.

SIR,—A perusal of Mr. Herring's letter in your last issue reveals nothing new, excepting it be a spirit of arrogance unusual in one so accomplished and courteous. I have always been one of Mr. Herring's ardent admirers. I do not know anybody more qualified than he to deal effectively with questions affecting the gas industry; and I desire to acknowledge his great work, and give him the fullest credit for all his efforts on behalf of the profession he adorns. But the precise point of my previous letter has been missed; and if the popular Edinburgh engineer desires those who differ from him—ignorance, he terms it—to believe him perfectly sincere in his protestations that the many small and "moderate-sized" undertakings must be as seriously affected by the new demurrage charges as the few large undertakings, then he should show by example, and not by a euphemism, that he believes equally in the sincerity and intelligence of others. If Mr. Herring does not give his professional friends credit for possessing faculty of mind equal to himself, he should, at all events, give them credit for possessing ordinary common sense—and common sense is always capable of yielding results the converse of unintelligence and ignorance.

What Mr. Herring says about the circular he sent out is quite correct. Previous, however, to receiving the circular—indeed, soon after the issue of the Railway Companies' new regulations—I studied the matter for myself; and, while viewing the new regulations with a little apprehension, I ultimately satisfied myself that we and other small and "moderate-sized" undertakings need not be inconvenienced by the new regulations. Notwithstanding the charge of "ignorance," I profess to know as much as Mr. Herring about the actual circumstances under which "even moderate-sized" gas-works in Scotland carry on their daily operations, and maintain that gas managers representing the gas industry in Scotland need be least of all "traders" affected by the Railway Companies' "idiotic" regulations. [The expression is Mr. Herring's.] However, appreciating the fact that the four largest gas undertakings in Scotland might sometimes be affected owing to the bulk of their maximum daily traffic, our Town Council, on my advice, desired to associate themselves in a sympathetic way with the object of the Edinburgh deliberations. I realized that without the backing of the entire gas industry in Scotland—not represented by the actual quantity of gas made but by the actual number of assenting gas undertakings whether affected or not—the large undertakings would have little hope of impressing the Board of Trade and gaining their objective upon a question of railway policy which affected the small general trader as much as, if not more so than, the large trader, public or private.

It is apparent I did not "miss the importance of the issues raised," although I failed to "conceive the injury which gas undertakings in Scotland must suffer as a consequence of the new regulations." To say "must suffer" is undiluted fantasy. Probably several undertakings may suffer owing to size and adverse circumstances, while a few others may suffer through indifferent management. But as only the art of management is involved, and as 250 out of a total of 260 gas undertakings might be classed as small and "moderate-sized," with easily regulated traffic, I dare say 96 per cent. of the undertakings in Scotland need not necessarily be affected by the new regulations.

I demur to Mr. Herring's statement that "representatives were appointed to act on behalf of practically the whole of the Scottish undertakings." According to reliable information, rather less than 10½ per cent. of the Scottish undertakings were represented by the deputation to the Board of Trade. It is only fair to add, however, that although only 10½ per cent. of the undertakings were represented, 80 per cent. of the total gas produced in Scotland was represented. Another mistake crops up in another quarter. I refer to the relative number of gas-works owned by corporations and private companies. Mr. Herring is reported to have stated "that 90 per cent. of the Scottish undertakings are in municipal hands." This is not in accordance with fact. The following table ["Gas World Year Book" for 1908] shows that only 20¾ per cent. of the gas undertakings in Scotland are in municipal hands:—

Owned by.	No.	Per Cent.	Gas Made.	Per Cent.
Gas companies . . .	206	79·23	2,668,542,000 c.f.	16
Corporations. . . .	54	20·77	14,003,327,000 ,,	84
	260	100·00	16,671,869,000 c.f.	100

In making a charge for the misuse of their waggons, the Railway Companies have right and reasonableness on their side. I never admitted that the charge of 1s. 6d. per day for a standing waggon was unreasonable. We hire waggons ourselves to some extent, and know perfectly well what a reasonable charge would be. Neither did I say the new regulations were perfect. But allowing for mismanagement on the part of the Railway Companies, have not they a solid grievance anyway? No doubt in several directions, particularly in regard to shipping traffic, there might be some more give and take. The shipowners, moreover, will have to amend their ways in future, because to some considerable extent they also have played fast and loose with the railway and colliery people's property. This, however, is not my contention. The question at issue, so far as I am concerned, is, "Will the gas undertakings of Scotland be more seriously affected by these new regulations than any other industry, &c., and if so, why?" Mr. Napier admits it; I deny it; and Mr. Herring is uncertain.

The Railway Companies have very good grounds for their drastic action; and their charge of 1s. 6d. per day for a standing waggon will now make it impossible for traders to flagrantly misuse the Companies' rolling stock, except at considerable pecuniary loss to themselves. Had the charge only been 4½d. or 6d. per day, traders would not have been deterred from using the Railway Companies' waggons as storage receptacles. Therefore the Companies' object to expedite traffic would have been nullified, and no all-round benefit would have accrued. Under such circumstances, matters might just as well have remained as they were. I am hopeful that the stiffness of the Railway Companies' charges will accelerate the emptying and return of waggons usually held up idle; thus eventually enabling all traders to get more regular deliveries. The cry all along has been for want of waggons. Now there should be plenty. Although the more frequent use of the same waggons will expedite traffic, still I think it foolish to expect, even under the new arrangements or any modification thereof, absolutely regular daily deliveries, owing to the extraordinary complexity of railway operations and the exigencies of railway and colliery trades. Such uncertainty is well known in Scotland. Therefore, with a prior knowledge of this, and the want of power to compel delivery within a specified time, one ought to make better local provision to ensure the maintenance of statutory obligations than the mere insistence on a "reserve of coal on rail," the waggon storage of which one declines to pay for.

Mr. Herring is playful in his reference to the "sea shore." I am afraid that is just where those who have been relying too much upon free waggon storage will be stranded; for the process of digging holes in coal bings and filling them up again will have to be more frequently resorted to now the Railway Companies are insisting on their rights. But, unfortunately, this cannot be done for nothing. In the past, the Railway Companies have contributed unwittingly and unintentionally to prevent the digging; now, alas, the gas manager who is affected may have to both dig and pay. Mr. Herring's illustration is a bit exaggerated; and if he has to adopt the extreme plan outlined by himself, then so much the worse for his undertaking. I am pleased to state that our "moderate-sized" undertaking will not have to adopt this practical, though exaggerated suggestion. If Mr. Herring would temporarily condescend to become a small or "moderate-sized" man, he would soon find out that the operation of digging holes in coal bings and filling them up again is, of necessity, a fairly regular operation already.

Mr. Herring made out a good case for the large corporations. But it was not incontestable; and as it was far from my design to prejudice his case, I studiously avoided reference to the Edinburgh conference and the Board of Trade proceedings. My previous letter had quite a different object in view; and it was not conceived in ignorance of facts, as Mr. Herring assumes.

Gas-Works, Broughty Ferry, Feb. 27, 1909. GEORGE KEILLOR.

The Air-Gas Explosion in Westphalia.

SIR,—May I ask you to insert a few remarks anent the report appearing in your issue of the 23rd of February of "A Disastrous Air-Gas Explosion," as at present it is capable of creating a wrong impression among the public as to the safety of air-gas machines?

The machine in question is one which produced a vapour gas of a highly explosive mixture—*i.e.*, the air which is brought into contact with the benzoline or gasoline is allowed to pick up the maximum quantity of hydrocarbons, and deliver them right up to the inlet of the burner at the point of consumption, where it is then, and only then, reduced by auxiliary air taken in at the burner, thus reducing it from a luminous flame to a bunsen flame. The machine spoken of in your report is not an air-gas machine in the proper sense of the term, or it would not have exploded.

This air-gas machine is known to me. It produces vapour gas of a non-explosive mixture at the point of generation for delivery through the main pipe and branches to the burners in a constantly poor and non-explosive state. It is what may be termed a true air-gas machine. When the burners used in conjunction with these machines are properly constructed, and are devoid of inlets for auxiliary air, it is impossible to experience any firing-back, or to obtain any explosion; but when machines are used which make rich vapour gas from gasoline, &c., explosions will, and do, happen. I have often had a pipe 1½ inches in diameter pouring poor gas into a room in close proximity to a light; but, owing to the poor (that is "safe") quality of the gas, neither ignition nor explosion took place.

The report also goes on to state that the town relied on this machine for light, and to a large extent for power. This proves conclusively the dangerous and highly explosive character of the gas used at Telgate; for it is only an explosive gas that can be so used. The poor quality safety air gas that I have before mentioned is not available for motive power, as it cannot explode.

Under the above circumstances, it behoves the public who are interested in air-gas machines to always make sure of purchasing a machine which delivers a poor vapour gas from ordinary commercial petrol, and not one which delivers a rich vapour gas from gasoline or benzoline.

Romford, Feb. 26, 1909. B. KEITH GREEN.

SIR,—In your last issue (p. 557), there appeared an article under the heading of "A Disastrous Air-Gas Explosion." Would you kindly allow me space to refer to it, by way of critical remarks on so-called air-gas and coal-gas explosions?

We must first note that the source of the information and description of what happened is taken from the issue of "Carbid und Acetylen" of the 15th of February. Then recollect that if the expressions "coal-gas explosion," "air-gas explosion," be used, they are equally erroneous terms, and endeavour to follow what did happen from the description given.

An escape of vapour of benzoline into the outer atmosphere had been noticed for fourteen days (?). This escape was evidently apart from either the gasholder or the generator, and very probably occurred within a confined space, such as the building which was destroyed having doors and windows closed, and a light kept burning to prevent the pipes freezing. It is probable such a chamber would have (say) 300 cubic feet of space within which to accumulate an explosive mixture of air and benzoline vapour, to be fired by the light.

In the results stated (after allowing for first-impression extravagances),

we find that only the building within which the explosion took place was destroyed; and that the gasholder contents, on it being torn, did not explode nor become ignited, nor was the holder put out of action—the partially-split portion would allow the gas to escape until it became sealed—and, apparently, it continued to keep up the supply. That it did do so is evident, as the manager shut the valves after the explosion to prevent the loss through broken pipes or other leaks. The gas-generator did not explode, and was merely moved from its seat.

It is important to note that the explosion did little damage to the holder; and, though partially split, the issuing gas did not take fire. This is what might have been expected; the issuing air-gas mixing with the atmosphere would prevent its ignition. As the already-diluted benzoline spirit was saturated with all the air it could carry, the least admixture by a further supply of air prevented its firing. An explosion under similar circumstances, by a mixture of coal gas and air, would in results probably be very much the same. In that case, the station meter (to take the place of the air-gas generator), on its connections being broken, would not explode, and on the gasholder being damaged the gas within it would not explode; but, contrary to air gas, if atmospheric air came in contact with the coal gas it would, on ignition, be consumed.

After the dynamite explosion in 1883, and the damage to a gasholder while I was the Superintendent Engineer of the Tradeston Gas-Works, Glasgow, a portion of the sheeting, about 40 feet square, was suddenly removed from the side of the full upper lift of a holder capable of containing 1,500,000 cubic feet of gas, and so permitted 500,000 cubic feet to ascend skywards on a dark night, about 10.10 p.m., in a gorgeous display of a brilliantly-lit surface of a beautiful burning cloud (the interior not being so bright as the outer portions exposed to the air), until the whole disappeared through exhaustion of the gas supply. The after-phenomenon, when the holder was at rest, and I had filled up the drips of the 24-inch inlet and outlet pipes with water from our fire-hose pipes, was fortunately a most uncommon one, and interesting to behold. Several large rents and holes had been torn through the crown of the holder, as if by fragments of a shell. The rise on the crown would probably be 10 or 11 feet. The holes nearest the crown gave out burning gas; while the three or four lower ones allowed atmospheric air to enter and consume the gas in fiercely-burning flames 9 or 12 feet long—the air reaching this length ere it was all consumed; the air and gas mutually consuming each other in the flame line of travel upwards towards the inner crown. The sheeting over this long flame—which burned harmlessly in an atmosphere of pure coal gas—became red hot for a breadth of 3 or 4 feet.

The points I have endeavoured to bring out are: (1) The apparent equal harmlessness of pure coal gas and of air gas while stored in holders. (2) Each class of gas equally, under certain stages of mixture with atmospheric air, will produce explosions on ignition. (3) A light should never be used to warm chambers within gas-works. Steam-heated or hot-water heated pipes only should be led round the apartment or the apparatus desired to be protected from frost; the heating fire and chimney being removed to a proper distance from benzoline or petrol drums or tank rooms. (4) The very slightest odour of these spirits should not be permitted in any part of the gas-works—not only because of its disagreeableness, but from the evident enormous loss occasioned by its evaporation in the open, together with the risks incurred. No such thing as an odour of petrol can exist in gas-generating stations fitted up under proper and responsible supervision.

Glasgow, Feb. 26, 1909. WILLIAM KEY.

The Fire at the Earlsfield Mantle Factory.—Messrs. Falk, Stadelmann, and Co. ask to be permitted to express, through our columns, their thanks to their numerous friends for the kind and sympathetic messages received from them with reference to the fire at their Earlsfield mantle factory. They state that, though the damage done was considerable, the manufacture of mantles has now been resumed on a large scale.

Wrongful Removal of a Meter.

At the Bolton Police Court, recently, a case was heard in which the Corporation summoned James Crompton, a plumber, for "unlawfully removing" a gas-meter from a house in Tonge. Mr. Harbottle, who prosecuted, explained that the summons was taken out under section 19 of the Gas-Works Clauses Act, 1847, which made it a punishable offence for any person to wilfully remove any works of the Corporation for the supply of gas. On Jan. 22, the Gas Committee heard that the tenant of a certain house was unable to get any light, and a fitter was sent to examine the premises. It was then found that the meter had been shifted. It seemed that the landlord had given instructions for some new fittings; and the defendant removed the meter without giving the Corporation notice, as required by the regulations. Mr. Harbottle added that, in the event of such things being removed, it was impossible for the department to check what gas was used; and he desired it to be known publicly that the removal of these articles was an offence. Consumers might be ignorant; but it was different in the case of plumbers. The defendant said he removed the meter to see if he could make it work; but a telephonic message was at once sent to the gas office. The Bench decided that, under the circumstances, the defendant should be simply ordered to pay the costs.

Congregation Overcome by Gas.—On Monday last week, a panic occurred in a church at Miltitz, near Dresden, owing to a sudden escape of gas. When the congregation found out that large quantities of gas were being liberated, they became stricken with fear of an explosion, and rushed to the doors. The pushing and struggling crowds blocked the exits, and thus delayed the escape of the whole congregation. The organist and all the members of the choir became unconscious; and a considerable number of the congregation, overcome by the gas, lay about the floor of the church. Ultimately one man, more collected than others, broke a few windows, and in this way relieved the sufferers, who were carried out and medically attended.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

On Monday last week, the following Bills were presented and read the first time: Alliance and Dublin Consumers' Gas Bill, Bungay Water Bill, Clevedon Water Bill, Donington Water Bill, Frimley and Farnborough District Water Bill, Grantham Water Bill, Heckmondwike and Liversedge Gas Bill, Lisburn Gas Bill, Lisburn Urban District Council Bill, Pontypool Gas and Water Bill, Risca Urban District Council Bill, Salford Corporation Bill, South Lincolnshire Water Bill, South Staffordshire Water Bill, Stourbridge and District Water Board Bill, Wakefield Corporation Bill, Wells Gas Bill, and Worksop Water Bill.

Petitions have been presented against the following Bills:—

Clevedon Water Bill, by the Long Ashton Rural Council.

Fermoy Urban District Gas Bill, by the Fermoy Gas Company.

Frimley and Farnborough District Water Bill, by the Farnborough Urban District Council and the Basingstoke Rural District Council.

Lisburn Gas Bill, by the Lisburn Urban and Rural District Councils and the Hillsborough Rural District Council.

Pontypool Gas and Water Bill, by the Monmouthshire County Council, the Llanfrechfa Upper and the Pontypool Urban District Councils, and the Blaenavon Company.

Risca Urban District Council Bill, by the South Mellons Rural District Council and the Western Valleys (Monmouthshire) Water and Gas Company.

Salford Corporation Bill, by the Earl of Ellesmere, the Eccles Corporation, the Swinton and Pendlebury Urban District Council, the Barton-upon-Irwell Rural District Council, and the Trafford Power and Light Supply (1902), Limited.

South Lincolnshire Water Bill, by the Bourne Urban District Council.

South Staffordshire Water Bill, by the Burton-upon-Trent, Sutton Coldfield, and Wednesbury Corporations, the Lichfield Rural District Council, and the Stourbridge Water Company.

Stourbridge and District Water Board Bill, by the Staffordshire and Worcestershire County Councils, the Clent, Pedmore, and Hagley Parish Councils, owners and ratepayers in these parishes, and the Stourbridge Water Company.

Wakefield Corporation Bill, by the West Riding County Council.

Worksop Water Bill, by the Duke of Newcastle.

HOUSE OF COMMONS.

Wednesday, Feb. 24.

THE BERMONDSEY EXPLOSION.

Mr. CARR GOMM asked the President of the Local Government Board whether his attention had been drawn to the verdict of the Jury at the inquest on the children killed by the gas explosion in Grange Road, Bermondsey, on the 30th of December, and whether he would institute a public inquiry into the conditions of disused sewers and the means for preventing similar accidents in the future.

Mr. BURNS said his attention had been drawn to the verdict, and he was communicating with the London County Council, the Common Council of the City of London, and the Metropolitan Borough Councils on the subject of the suggested inquiry.

The following Bills have been read a second time and committed: Ammanford Gas Bill, Bury Corporation Bill, Cardiff Corporation Bill, Conway Gas Bill, Heywood Corporation Bill, Llanelly Water Bill, Mountain Ash Urban District Council Bill, Northallerton Water Bill, Prestatyn Urban District Council Bill, Swinton and Mexborough Gas Board Bill, Watford Urban District Council Bill.

The petitions presented by the Frimley and Farnborough District, Wey Valley, and Farnham Water Companies and the Farnham Rural District Council against the Aldershot Gas and Water Bill have been withdrawn.

Mr. Courthope (Rye) has given notice of his intention to move, at the second reading stage of several Water Bills, that the Committee to whom they are referred are to be instructed to insert a clause requiring the promoters to supply, on demand, water by meter to any person needing the same for domestic, farming, or trade purposes "at a charge not exceeding 1s. per 1000 gallons, in addition to a charge not exceeding 5 per cent. on the additional initial outlay involved in providing such supply."

During the past week a Bill was presented "to enable local authorities to contribute towards the expenses of legal proceedings and Private and other Bills involving questions of common interest;" and another "to provide for the taxation and purchase of land by local authorities."

Reduction of the Capital of the Tarapaca Water-Works Company, Limited.—Last Saturday Mr. Justice Parker sanctioned resolutions which had been passed for the reduction of the capital of the above-named Company, by returning £2 per share to the shareholders. Mr. Martelli, K.C. (with him Mr. Howard Wright), said the Company had been a most prosperous one, and now had in hand a sum of more than £80,000 for which there was no requirement. The Company were incorporated in 1888 for the purpose of supplying the town of Iquique with water; and in eight years they paid off, out of profits, £50,000 of debentures, and had paid dividends ranging from 4½ to 10 per cent., besides accumulating upwards of £173,000. A portion of this sum had been applied in writing off capital expenditure on the works, and £14,000 had been set aside as a special reserve for debts. His Lordship dispensed with the further use of the words "and reduced" as part of the title of the Company.

LEGAL INTELLIGENCE.

GAS-WORKS VALUATION APPEALS IN SCOTLAND.

As briefly mentioned in "Notes from Scotland" in the last issue of the "JOURNAL," a Special Bench, consisting of Lord LOW, Lord DUNDAS, and Lord MACKENZIE, recently sat in the Court of Session at Edinburgh to dispose of appeals under the Valuation of Lands (Scotland) Acts.

Edinburgh and Leith Gas Undertaking.

The Edinburgh and Leith Gas Commissioners appealed against the entry of their undertaking in the roll of the burgh of Edinburgh at £94,393, and asked that the valuation be reduced to £87,745.

The Commissioners were represented by Mr. CONSTABLE, K.C., and Mr. J. DUNCAN MILLAR (instructed by the Clerk, Mr. J. M'G. Jack); and Mr. COOPER, K.C., and Mr. SPENS (instructed by Mr. A. M'Dougall), appeared for the City Assessor.

The appeal was taken on two grounds: (1) Whether, in arriving at the valuation of the undertaking on the "revenue" principle, the whole of the expenses of management, or only the proportion thereof applicable to a tenant, should be allowed as a deduction from the gross revenue; and (2), whether or not, in allocating the total valuation over the three areas in which the undertaking lies, there falls to be taken into account the value of the land occupied by the appellants' pipes? The undertaking is situated partly in the city of Edinburgh, in which the whole of the works are, partly in the town of Leith, and partly in the county of Midlothian. In Leith and Midlothian there are only underground pipes. The method of arriving at the valuation hitherto has been that the Assessor for Edinburgh has fixed the total, and then allocated the sum in proportion to the amount of the capital cost of the undertaking in the respective areas. Until the present year, the figures of the Assessor for Edinburgh have been accepted by the other two Assessors. For the present year, the allocation was: To Edinburgh, £94,393; to Leith, £3078; and to Midlothian, £2296—a total of £99,767. In previous years, in arriving at the total valuation, the Assessor allowed, as a deduction from the total revenue, the whole expenses of management; but this year he only allowed a deduction of 60 per cent., holding that the remaining 40 per cent., or £4394, represented expenses of management incurred by the Commissioners as landlords of the undertaking, and that this did not fall to be allowed as a deduction. He did not allow any deduction in respect of tenants' profits; and the Commissioners did not take exception to the valuation on this account. The total expenses of management for the year from Whitsunday, 1907, to Whitsunday, 1908, amounted to £10,985; and it was agreed, for the purpose of this case, that the proportions applicable to landlord and tenant were £4394 and £6591 respectively. It was admitted that the length of the Commissioners' pipes within the city of Edinburgh was 196 miles; within Leith, 37½ miles; and in Midlothian, 24 miles; and that the value of the land occupied by the pipes should be held to be at the rate of £1000 per mile so far as within Edinburgh and Leith, and £500 per mile so far as in Midlothian. The total value of the land occupied by pipes was therefore: In Edinburgh, £196,000; in Leith, £37,500; and in Midlothian, £12,000—in all, £245,500. The Assessor for Midlothian accepted the calculation of the Assessor for Edinburgh, and entered the sum brought out as applicable to the county. The Commissioners appealed against the entry; but their appeal was too late. The county of Midlothian was consequently not in this case. The Assessor for Leith did not accept the figures, but added £2000 to the sum brought out by the Assessor for Edinburgh, on the ground that the value of the land occupied by the Commissioners' pipes ought to be taken into account. The Commissioners appealed to the Leith Valuation Court; but when the appeal came on for hearing, they intimated that they were not prepared to accept the Edinburgh Assessor's principle of allocation of the value, and intended to challenge it in the Edinburgh Valuation Court. The entry by the Assessor for Leith was thus allowed to stand. The Edinburgh Court, after a hearing (see "JOURNAL" for Sept. 29 last, p. 865), affirmed the decision of the Assessor; being of opinion that, apart from whether the undertaking was a profit-earning one or not, the cases on the question of whether a deduction of the whole or only a part of the expenses of management were conflicting (*vide* Leith Harbour and Dock Commissioners in 1907), but that they were bound by the cases of the Magistrates of Glasgow and the City Parish of Glasgow, in 1885, which laid down that the whole expenses of management were allowable; that in respect that the Gas Commissioners were empowered to raise, and did raise, revenue to place to a reserve fund, the undertaking was a profit-earning one as interpreted by the decisions of the Court, and that therefore only that proportion of the expenses of management applicable to a tenant was deductable; that there was no statutory authority for the allocation made by the Assessor; and that, on the authority of the cases of the Water Commissioners of Dundee, in 1883, and of the Glasgow case in 1885, the allocation to each of the assessment areas fell to be made in proportion to the structural cost of the works within the respective areas, and not in proportion to the value of the undertaking, and that, therefore, the value of the ground occupied by the pipes, for which no price had been paid, could not be taken into account.

It was contended for the Commissioners that, as they are debarred by Statute from earning profits, they were entitled to a deduction from gross revenue of the whole expenditure in the management and working of the undertaking, and not merely of a proportion representing tenants' expenditure; that, in fixing the price of gas, as they are not entitled to levy rates beyond what is necessary to meet the charges for manufacture and distribution of gas, maintenance and management, and all other necessary charges incidental to the carrying on of the undertaking, which are properly chargeable against revenue, and the sums required to be set aside for sinking and reserve funds, any surplus available from one year's earnings being applied towards the reduction in the price of gas the ensuing year, the undertaking should be valued as a non-profit earning undertaking, in accordance with the decisions in the Glasgow case, the Caledonian Canal case in 1886, and the County Council of Argyle case in 1895. The Leith Harbour and Docks case of 1907, it was pointed out, in which only 6-10ths of the expenses of management were allowed as a deduction, was an instance of an undertaking which, under its Statutes, is authorized to raise, and does in fact raise, a large surplus revenue; and it is therefore a profit-earning undertaking. The Assessor for Edinburgh had treated the gas undertaking as a non-profit undertaking. The Commissioners maintained that he had erred in not applying further the principle of valuation he had adopted, and in not allowing the whole expenses of management to be deducted from the gross revenue, The Commissioners had admitted the sum of £4394 to represent the proportion of landlords' expenses of management for the purposes of this case, in order to avoid the necessity of a proof; but in the event of their contention under this head not being upheld, they reserved their right to dispute the basis of the Assessor's allocation of expenses between landlord and tenant on any future occasion. On the second ground of appeal, the Commissioners maintained that, on the authority of the Dundee Water Commissioners' case in 1883, the value of the ground in which the gas pipes and mains are laid should be taken into account; the ground being subject to valuation as "lands and heritages" within the meaning of Section I. of the Valuation (Scotland) Act of 1854, and therefore included in the total valuation of the gas undertaking. Under the Gas-Works Clauses Act of 1847, which is incorporated in the Commissioners' Act of Parliament, and particularly section 6, the Commissioners have acquired a permanent and exclusive right to the solum of the streets and roads within which their pipes and mains are laid, and which they occupy as owners under their statutory title. The Assessor, it was maintained, was bound to include the value of the land occupied by the pipes in estimating the structural cost and value of the undertaking for allocation purposes. The Commissioners maintained that the law upon this subject was settled by the decisions given in the cases of *Hay v. Edinburgh Water Company*, in 1850, affirmed by the House of Lords in 1854; *Barony Parish Road Trustees v. Glasgow Water-Works Commissioners*, in 1868; *Craig v. Edinburgh Street Tramways Company*, in 1874; *Magistrates of Glasgow*, in 1874; and *Heritors of Strathblane v. Corporation of Glasgow*, in 1899. The Commissioners also founded upon the case of the Edinburgh electric light undertaking in 1906. If their view were well founded, the total structural cost or value of the whole gas undertaking amounted to £1,427,696, of which the sum of £1,314,516 was applicable to Edinburgh; and the valuation of the portion of the undertaking within Edinburgh fell to be reduced to £87,745.

On behalf of the Assessor for Edinburgh, it was contended that the Commissioners had power to raise surplus income, and had, in fact, done so (in their reserve fund) to the extent of £11,315, and that their undertaking was therefore in the category of profit-earning undertakings, as determined by the Leith Harbour and Docks case; that in any event the case of the Dundee Gas Commissioners, in 1881, was a direct authority against the allowance of the landlords' proportion of expenses of management as a deduction—a view which was approved of by Lord Low in the Leith Harbour and Docks case. It was further contended that an allocation of the valuation of an undertaking in different assessment areas falls to be made among the areas in proportion to the amount of the cost of the portions of the undertaking within the respective areas. The Commissioners, it was pointed out, had admitted that they paid no sum for the right to lay pipes in the roads and streets; and therefore the decision of the Magistrates was right (Water Commissioners of Dundee and Magistrates of Glasgow). In the latter case, an instruction was given by the Court to take the value of the ground into account; but that was because wayleave had been paid for. The cases relied upon by the Commissioners (other than that of the Magistrates of Glasgow, already distinguished from the present case) related to the valuation of undertakings on the "contractors" principle. In any event, the Commissioners' right to the ground occupied by their pipes was not of such a nature as would entitle them to treat the ground as an asset in their accounts. Any right they might have in the ground was a right inferior to proprietorship. The Commissioners had no heritable title to, nor active possession of, the ground, and could not deal with it in any other way than for the support and protection of their pipes. They could not sell nor burden it; and, further, they had no right to any particular part of the ground of the streets and roads. Their right was merely to the ground which, for the time being, their pipes happened to occupy. No change of circumstances had arisen to justify an alteration of the principle which had been acquiesced in without demur by the Gas Commissioners for twenty years. It was pointed out that the Gas Commissioners had maintained before the Valuation Court in Leith that the value of the ground occupied by their pipes should not be taken into account, and that they had not appealed against the decision of the Leith Court. The position of the Gas Commissioners was thus for the purpose of endeavouring to reduce the amount of the valuation in Edinburgh by the sum by which the valuation of the undertaking in Leith had been increased. If the Commissioners desired to have the allocation of the valuation of their undertaking carried out on a uniform basis, they had the remedy in their own hands; they might have the valuation made and allocated by the Assessor of Railways and Canals. This course had been pressed upon them by the Assessor for Edinburgh, and was recommended to the predecessors of the Commissioners, the Edinburgh Gaslight Company, by her late Majesty's Judges in the appeal made by the Company against the determination of the Magistrates of Leith in regard to the valuation of their undertaking for the year to Whitsunday, 1887. It had been practically arranged that both the Edinburgh and the Leith Assessors should waive their points of difference for another year, by which time it was expected that the parties would have called in the assistance of the Railways and Canals Assessor. Owing to the Magistrates of Leith unexpectedly insisting upon the case before them proceeding, this arrangement became impossible. If, as was expected, the undertaking should be, in future, assessed by the Assessor of Railways and Canals, a decision in the present case would not regulate future valuations. The Commissioners did not appeal against the entry in the roll for the county of Midlothian. Whatever the result of the

present appeals, there would thus be entries in each of the valuation rolls made up on differing principles, which could not be reconciled.

Mr. CONSTABLE, for the Commissioners, submitted that the balance of authority was entirely with him. It could not be argued that the occupation which the Commissioners had was a beneficial occupation, for this reason, that there seemed to be an extremely broad distinction between the case of the Commissioners and that of the Leith Docks Commissioners. On the other hand, he found it extremely difficult to distinguish between this case and the early Dundee gas case, where it was held that the subjects were not beneficially occupied. In the case of the Leith Docks, the Commissioners had almost unlimited power to add to the construction of their undertaking. They were making an income of £30,000 a year to provide for this purpose. There was nothing of the kind in the present case. The only thing which was founded upon against them was the formation of a reserve fund; but, he submitted, this all depended upon the purposes to which the reserve fund was applied. These purposes were chiefly to meet deficiency of income, cost of renewals, and any extraordinary claims which might be made upon them. This could not be regarded as the earning of profit. There was another purpose—to replace the loss arising on the sale of old works. This was exactly in the same position as the repayment of borrowed capital; so that the powers were no wider than they were in a numerous class of undertakings, such as the Ayr harbour, the Mersey harbour, and the Dundee gas cases, where the power had been held to be so limited that it could not be regarded as beneficial occupation. As to the second point in the case, if the Commissioners did not succeed, the result would be that, although they were assessed upon £99,000, they would have to pay assessments upon £101,000. He contended that, before the assessing authorities could impose their assessments, they must have the assessable value split up among the various authorities, which had not been done in this case.

Mr. COOPER, for the Assessor, argued that it had been recognized throughout all the cases that the landlords' share of rates and charges must not be deducted from the gross revenue in fixing what the rental should be. On the second point, he considered it would be very unfair if the different communities did not get the allocation of the £99,000 in proportion to the outlay which the Commissioners had incurred in each of the communities, and which was the only thing which was producing the £99,000. He did not require to pay a penny out of his gas-rates for the purpose of piping. The Assessor of Railways and Canals valued the water-works of Edinburgh, Glasgow, Dundee, Aberdeen, Perth, Alloa, Burntisland, Dumfries, Dunfermline, Gourock, Kirkcaldy, and Kirkintilloch. He valued gas-works in Glasgow, Alloa, Gourock, Kirkcaldy, and Stirling; and electricity works in Glasgow, and the Scottish electric power works. The information he gave was that, following the two decisions of their Lordships, he had allocated the value of the works as between the different localities on structural cost, not taking into consideration anything which had not been paid for, and which, therefore, did not enter the capital account.

Mr. DUNCAN MILLAR pointed out that the land which was occupied by pipes was, in one sense, a most important part of the undertaking, because without it the concern could not be carried on.

The Court reserved judgment.

Bellshill Gas-Works.

The Bellshill Gas Company, Limited, appealed against the valuation of their works being fixed at £1373, and asked that the entry be reduced to £664. The only objection taken by the Company was as to the amount of deduction allowed for repairs. The Assessor allowed £249, but disallowed £879; being a proportion of an expenditure of £2117. Of this sum of £879, the Company claimed to be allowed £700, as equivalent to the cost of repairs upon the retort-bench. In 1907, there were in use in the Company's works two benches, each containing nine retorts, erected in 1891 and 1897, at a cost of £520 and £289 respectively. A new bench of 35 retorts was erected, and the old ones demolished, about September, 1907. The new bench had given the Company an additional capacity of 17 retorts, which was greatly in excess of present requirements. Only 18 of the 35 retorts had been in use at one time. The new retorts were more efficient than the old ones; and the output of gas had increased by 2½ million cubic feet during the past two years. It was estimated that the original benches might have been repaired at a cost of about £800. For the Company, it was argued that the Assessor was bound to treat the 18 retorts of the new bench as having been erected in place of the 18 retorts which, though capable of being repaired, had been demolished, and a proportion of the cost of the new bench as equivalent to repairs on the demolished retorts. The proportion applicable to repairs of the total expenditure of £2117 (taken in round figures at £2000) was £1030; but it was conceded that the new retorts were more modern and efficient, and consequently the Company were prepared to deduct a sum of £330 from the £1030 on this ground. The balance of £700, it was argued, formed a proper deduction, representing repair and renewal of, and depreciation of, the retort-benches. This expenditure was properly not a capital or landlords', but a revenue or tenants', expenditure.

For the Assessor, it was argued that he had made an allowance for repairs in excess of the average expenditure for repairs and maintenance. He considered that the Company were not entitled to a deduction of the whole sum actually spent in one year. In any event, what the Company had done was not to repair old retort-benches, but to erect a new bench on a new site, and therefore no part of the expenditure was of the nature of expenditure upon repairs.

Lord LOW, in giving the opinion of the Court, said the Company's contention was that there was a sum of £700 which, in the ordinary course, would have been spent in repairs, but which they did not so spend, because, instead of repairing old retorts, they built new ones; and their argument was that this £700 was an expenditure which was necessary to earn the revenue for the year. But, in the first place, he doubted very much whether the Company would have followed the course which they said they might have adopted—whether the £700 would have been spent upon repairs at all. The facts were that they had a bench of 18 retorts, and £700, or thereby, if put upon these 18 retorts, would have placed them into good working order for another year; but they found it expedient to demolish these 18 retorts, and to build a new bench altogether. Even according to the evidence of their own Engineer, the £700, if laid out upon the old retorts, would not have been spent upon what would have been properly repairs, but would have been really renewals altogether. If this were so—if, instead of renewing the old retorts, the Company chose to build a new set, upon a different site—they could not claim any deduction in respect of what they would have done, or might have done, if they had retained the old retorts. Even supposing the expenditure of the £700 had been of the nature of repairs, he would have come to the same conclusion, because, if they were to take the actual revenue of the Company, they must take it as it was actually earned; and when they did not, in fact, renew the old retorts, but, for their own benefit, built new ones, the calculation upon which the valuation of the subjects was to be brought out seemed to him must be made on the footing of what actually happened, and not upon the hypothetical footing of what might have been, or might have happened. He was therefore of opinion that the appeal should be refused, and the decision of the Lower Court affirmed.

SUPPLYING WATER BEYOND STATUTORY LIMITS.

High Court of Justice, Chancery Division.—Friday, Feb. 19.

(*Before Mr. Justice* NEVILLE.)

To-day his Lordship had before him an application by the Attorney-General, on the relation of the Bristol Water Company, for an injunction to restrain the West Gloucestershire Water Company from supplying water beyond the limits of their statutory district, or within those limits for use outside.

Mr. UPJOHN, K.C., and Mr. CANN (instructed by Messrs. Woodcock and Ryland, agents for Messrs. Gerrish, Harris, and Co., of Bristol) appeared for the Attorney-General and the Bristol Water Company; Sir ALFRED CRIPPS, K.C., and Mr. CHRISTOPHER JAMES (instructed by Messrs. Stanley Wasbrough and Co., of Bristol) represented the defendants.

Mr. UPJOHN, in opening the case, said the dispute between the parties arose with regard to a large house, called Hollywood Towers, with a model dairy, gardener's cottage, stables, &c., attached, belonging to Sir George White, and occupied by his son, situated partly within the parish of Henbury, in the district of the Bristol Water Company, but very near the border of the parish of Almondsbury, which was within the defendant Company's district. The parish boundary of Henbury ran through the property; part of it being in a detached portion of another parish, called Compton Greenfield (outside the limits of both Companies), which had now been added to Henbury. There was a suggestion that this brought it within the limits of the Bristol Company's supply; but he did not lay any stress upon this, because he appeared for the Attorney-General, and the question was simply whether or not defendants were going outside their own limits. [Plans were put in showing the exact position of the property and the mains and pipes. From these it appeared that the defendants' main came to a dead-end in the high road near the property in question, but was continued a short distance outside their limits to a hydrant and overflow for the purpose of allowing accumulations of muddy water to be run off. Above this, just outside defendants' district, a service-pipe was taken off to supply Hollywood Towers; there being a valve and meter belonging to the Company for which the occupier paid a rent of £3 per annum. The highest part of the highway in which the main was laid was 211 feet, and the level of the ground floor of the house was 216 feet; and the cistern into which the water passed was at the top of the house—probably 20 feet higher.] The learned Counsel said he should contend that the delivery of the water was not at the point in the main within the defendant Company's district, but in the house.

Justice NEVILLE remarked that this argument sounded rather thin. He should have thought that if water could be delivered at all, it could be delivered under pressure. The whole question seemed to be whether there was power to deliver water outside the district. There appeared to be two issues—one was whether a water company could deliver water for use outside their limits; the other, which was a question partly of law and partly of fact, whether delivery was within the district.

Mr. UPJOHN concurred. He then read the agreement entered into between Sir George White and the defendants, some of the minutes of the Company with regard to the matter, and the correspondence; the result of which was to show that the pipes, &c., were the property of the consumer, who paid the expense of doing the work. He then proceeded to refer to the four Acts of Parliament under which the defendants act, dated respectively 1884, 1887, 1899, and 1902, and read various sections with the view of showing that the Company were confined strictly to their own limits. One question was what was the meaning of the word "supply;" and with reference to this he cited the case of *Gaslight and Coke Company v. South Metropolitan Gas Company*,* in which it was decided that the word did not mean simply "sell and deliver," and that the supply did not cease at the meter, but continued until the gas reached the burner. In the present case, the water which ran away through the hydrant outside the defendants' district was not paid for; but it was nevertheless supplied. Again, no property in the water passed to Sir George White until after it had gone through the meter; and, in any event, therefore, it must be held to be supplied outside the limits.

A long discussion ensued on the points involved in the case cited, more particularly with regard to the judgments in the House of Lords; the learned Counsel contending that many of the observations there made applied directly to the present case. The powers given to water companies enabled them to interfere very materially with the natural flow of streams and underground water; and it was therefore to be inferred that they were intended to be strictly limited to the district

* See "JOURNAL," Vol. L., p. 337; Vol. LI., p. 374; and Vol. LIV., pp. 256, 307.

allotted to them, as otherwise the burden on the public might be indefinitely increased. It was this point the Attorney-General desired especially to press upon the Court. The plans and the relevant facts being agreed, there was no need to call evidence at present.

Sir ALFRED CRIPPS said the case was very important, because the injunction asked for was in a general form, and, if granted, would preclude the defendants from supplying any person with water for use in any place outside their area; and the Company were supplying water to certain places in the same way as they were doing to Hollywood Towers, for use outside their limits, with general assent, and with great advantage to everybody. If they could not do this, some alterations in their arrangements would have to be made. The question raised, as had been pointed out, was not what were the rights of the Bristol Water Company, but those of the defendant Company.

Justice NEVILLE said all he could decide was whether or not the facts showed a supply of water outside the limits.

Sir ALFRED CRIPPS said if the facts showed this and also consumption outside, which to his mind was the important point, and his Lordship decided that this was permissible, it would be a matter for discussion hereafter whether or not any other particular case came within this principle. In his view, the important question was whether a water company possessing ordinary powers were entitled to supply water inside their limits for use outside. Though these powers had been conferred on water companies for a number of years, this particular point had never been raised. In all previous cases, the question had not been what were the powers of the company in question, but what were those given to neighbouring companies or corporations, who had a monopoly conferred upon them. No water company, apart from some statutory monopoly, had any monopoly in their own district. Even if the present defendants were acting *ultra vires*, the Bristol Water Company could not, as such, complain. They were obliged to apply to the Attorney-General, and get him to intervene. This was the great distinction between the present case and that of the two Gas Companies which had been dealt with at such length, and on which he also relied, because the great detail into which the various learned Judges went regarding some of the points raised there would have been quite unnecessary if his learned friend's contention were right, that a water company were in exactly the same position as a gas company. He submitted that the words of the Act only meant that within their limits the defendant Company were under the obligations contained in the Water-Works Clauses Act, 1847, and enjoyed the privilege of interfering with the streets and roads for laying pipes, and they were also protected against competition by a local authority, if they were furnishing a proper supply of water. Apart from this, he submitted that there was nothing to preclude them from selling water to anyone they pleased, for any purpose whatever. He contended that it was quite clear that the supply of water was given in the parish of Almondsbury. It was true the meter was just outside the limit; but he did not think this could affect the question. The real place of supply was where the water left the main. He cited the case of *Halifax Corporation v. Soothill Upper Local Board*,* in which Vice-Chancellor Bacon and the Court of Appeal held that a township which had the right of purchasing water in bulk up to a certain quantity from a water company were entitled to sell it at a profit to a neighbouring township. He also referred to the case of *Halifax Corporation v. Morley Corporation*† to show the distinction to be drawn between "supply" and "use."

Mr. JAMES added a few observations on behalf of the defendants, and cited the case of *Attorney-General v. Great Eastern Railway Company*, in which the defendants were held to be within their powers in letting rolling-stock to a neighbouring company—the Tilbury and Southend Company. He submitted that this was an analogous case. According to the contention on the other side, the defendants could be restrained if they put up a stand-pipe on their main within their district, and allowed a cottager residing just outside the limits to draw water from it on payment of a small sum.

Justice NEVILLE said he was in favour of Mr. Upjohn on the main point—viz., that the supply in question was unauthorized; but he did not see his way to granting the injunction in the terms asked, restraining the "use" of water outside, which was a different point, and did not arise on the view he took of the Act. If he granted an injunction in the form asked, supposing there were premises partly within and partly outside the district, and water was supplied to a large cistern within the district, from which the owner led it to taps outside, he should hit that. This obviously raised a very nice point, which was not raised here. He thought he must strike out the words "for consumption or use," but grant an injunction restraining the defendants from supplying water outside their district.

Mr. UPJOHN said if his Lordship made it clear that he was not deciding any question about consumption or use, he would accept that.

Justice NEVILLE said the declaration would run: "That the defendant Company is not entitled to supply to any person water within the said parish of Henbury, or in any other place or places outside the area within which the defendant Company is by Statute authorized to supply water." The injunction would be in the same terms.

Mr. UPJOHN said this would satisfy him.

Judgment.

Justice NEVILLE said the case raised a point of great importance, and, curiously enough, it had not been previously decided. It was a short point, turning upon the construction to be put upon defendant Company's Acts of Parliament. Two plans had been put in, showing precisely what had been done. The Company did the whole of the work shown; but so far as the apparatus lay in the parish of Henbury, it was done by the defendants, but the cost, as he understood, was paid by Sir George White. The water was conducted past the meter to a dead-end, in which there was a hydrant, used for the purpose, among other things, of clearing of sediment and other matter the water which flowed to the end of the pipe. The point raised was that such a supply of water was incident to the powers of the defendants, and that there was nothing in their supplying Sir George White, though he resided on premises situated outside their district, inconsistent with the powers granted them by their Acts of Parliament. To put it in another way, they submitted that what they were doing was only reasonably incident to the use of their property, and to the exercise of the powers vested in them. It seemed to him that this could not be so. They were supplying Sir George White precisely as they supplied all other customers, subject to this—that he took the water by meter, and probably most of the other customers paid by rate on the value of their houses. But inasmuch as they were limited to a district, whatever the effect of that limitation might be, it could not be said that the supply of water outside was incident to a supply within, because this would do away altogether with the limitation of the district. The Railway Company's case, and others of a similar kind, had been referred to; but they did not assist in the determination of the one before him. The real question here was, as he suggested early in the argument, what was meant in defendants' Acts by the words "supply of water." Turning first to the Act of 1884, he found that in section 4 a territorial limit was inserted: "The limits of this Act for the supply of water shall be the parishes and townships," and so on. Then section 6 defined the purpose for which the Company was established—viz., "for the purpose of making and maintaining the water-works, and for supplying water within the limits of this Act." He therefore took it that any supply of water outside the limits of the Act was something altogether beyond the limits of the purpose for which the Company was established. Again, he had to find out as best he could what the Legislature intended by the words "supply of water" or "for supplying water." There were other sections which all referred to the limit of a district for the exercise of the power of the Company; and section 56 contained a proviso "for the supply by the Company, within the limits of this Act, of water to any such sanitary authority, company, corporation, public body, officers, or persons respectively, whether in bulk or otherwise, and for what purposes soever, for use within such limits." In the succeeding Acts, one of which was the Act of 1899, by which the limits of the district were enlarged so as to include the parish of Almondsbury, section 56 was re-enacted with a variation; the substantial alteration being that the right to sell, which in section 56 was "in bulk or otherwise," was limited to sale in bulk. The case of *Gaslight and Coke Company v. South Metropolitan Gas Company*, both before the Court of Appeal and in the House of Lords, afforded considerable assistance in arriving at the meaning of the word "supply" in the Act in question, because he thought there was a fairly close analogy between the supply of gas and the supply of water in the particulars relied upon in the case mentioned. What did "supply" mean? Did it mean substantially the same thing as the supply of gas was held to mean in the case referred to? The distinction between the Statute he had to construe and the proviso in the case in question, was this: In the case referred to, the Court was dealing with a monopoly granted to companies within their own districts; and it was said that this was distinguishable from the grant of powers to a company within their own district. With regard to this he entirely agreed. Supposing this had been a monopoly clause, and the provision had been that the defendants were not to supply water in the district of the plaintiff Company, then that Company would themselves have a right of action, and could have restrained the defendants from so doing. It seemed quite clear, in the present case, that the plaintiff Company could not make any case of that kind; and the only question to be decided was whether the act of the defendant Company was *ultra vires*, in which case, at the suit of the Attorney-General, the Court ought to grant an injunction. But otherwise, so far as regarded the interpretation to be put upon the use of the word "supply," he did not see that it made any difference. In either case the Court had to decide what was meant by "supply"—in one case the supply of gas, in the other the supply of water. In the case of gas, though it might be said that the property in it passed from the supplying company to the receiving company at the meter, it was held that, though this might be said to be the point of sale and delivery, it was not the point of supply; that the meaning of "supply" in reference to gas was supply for the purpose of use, and that it would be perfectly useless to send the gas to the meter unless under conditions which would enable it to be employed for the purposes of lighting on the premises for which use it was intended. Exactly the same reasoning applied in the case of water. It would be no good in this case to send the water down to the meter. It must be supplied at the point where the consumer desired to make use of it; and he thought the water was supplied upon the premises of Sir George White, either where he took it through stand-pipes, where it was transferred into a cistern, or where it was made available for use by the consumer. In the present case, the meter itself was outside the boundary; but he put the matter upon broader ground than that. He thought the words "supply of water" covered its delivery for use at the terminals, wherever they might be, at which the consumer took possession of it, so to speak, and devoted it to his own use. Before leaving the question of the meaning of "supply," he must deal with section 56 of the Act of 1884 and section 12 of the later Act. An argument had been addressed to him, not without force, that in this case, where the Legislature intended to limit not only the supply of water but the use of the water to the district defined, the express words were used; and it was said that the supply must be not only within the district, but for use within the district. But when one considered the Act carefully, this was quite intelligible, and was consistent with the construction of the word "supply" which he had attributed to it, and for this reason—that, with regard to all other supply outside section 56, upon the construction he had put upon the Act, the Company would be limited to a supply within the district. If it was brought to the point at which it was used outside the district, it would be *ultra vires*. But when they came to a supply of water in bulk, they might supply it to an individual (this would be within the terms of the Act), and he might himself utilize it outside the limits, because the water once supplied to him within the district would be beyond the control, and altogether outside the delivery, of the defendant Company. It seemed to him that the meaning of the words was that nobody should be entitled to be supplied with water under that section who intended, when he got it, to use it outside the district. This was not only consistent with, but was in some sense confirmatory of, the view he took of the word "supply." It appeared to him that the defendants had exceeded their powers, and that the injunction must be granted in the terms already mentioned.

* See "JOURNAL," Vol. XXIII., p. 810; Vol. XXIV., p. 15.

† *Ibid.* Vol. LXIII., p. 855.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Ordinary Meeting of the Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. W. G. BRADSHAW in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

BAD TRADE AND OTHER CAUSES FOR REDUCED CONSUMPTION.

The CHAIRMAN, in moving the adoption of the report and accounts, said: The year 1908, with the latter part of which the report and accounts deal, was not one upon which manufacturers can look back with any degree of satisfaction. It was marked by stagnant trade and small profits. The Chairman of a great manufacturing concern in the North of England declared yesterday that, in all his experience, he had never before known every branch of trade depressed in every country in the world. I think that is a pithy and very true summary of the year. Of course, this trade depression has made itself felt even in the gas industry, which is, to a large extent, dependent upon the prosperity of other trades and manufactures. In our own case, for years past, we have been accustomed to look forward to a steady growth in our business year by year; and, for the first time for many years, we have failed to find the growth. Indeed, I cannot say more than this, that we have been enabled to get through the year without any serious loss, and generally to hold our own. The decrease in our sales which I had to chronicle in August last, has been continued in the second half of the year, when we sold 38¼ million cubic feet less gas than in the corresponding half of 1907. This is equivalent to nearly 2·4 per cent. on the amount we then sold. Altogether in 1908, we sold 65½ million cubic feet less than in 1907. This is very nearly 2 per cent. on the sales; and in money is equivalent to about £8000. This falling off, I think, may be attributed to three causes: First of all, to the cause I have already mentioned—viz., bad trade, which leads to idle workshops and empty houses. In our district, we have no fewer than 7000 houses which are unoccupied; and although not all these 7000 houses have gas supplies, about 3500 of them take gas from us. Some of them have two supplies, and some three. So that altogether out of these 7000 houses we have 7300 supplies which are not being used at the present time. They are made up of 3581 ordinary meters, and 3724 coin meters. Then, bad trade has another effect, even with consumers who do continue to take gas. They look with greater strictness to their gas bills, and they economize all they can in their consumption—far more than they would if times were more easy and prosperous. Then, the second cause which has led to a falling off of consumption was the fine, warm autumn. You remember what phenomenal weather we had in October. This weather continued, with the exception of about four days, until the end of the year; and it had great effect on the sales of gas. Then the third reason is the growth there is in the use of incandescent burners, and especially the introduction of the inverted burner, which, while it adds to the beauty and the efficiency of gas lighting, and so, in the long run, tends to extend its use, at the same time leads to economy in consumption. These three causes—bad trade, the good weather, and the use of incandescent mantles—are quite sufficient to account for the small falling off we have had in the sales; and I must say, as I look on them, they afford me a good deal of encouragement and comfort, because bad trade will not always be with us, and many wise people say they see signs of reviving trade. Bad weather in our British Isles is not often far distant. In the last few weeks, we have had very gratifying weather from the gas manufacturers' point of view; and, as I have said, the use of incandescent mantles merely means that people will recognize the beauty and efficiency of gas lighting, and so they will be attracted to its use. After all is said and done, in 1908 we sold as much gas as we did in 1906, and we sold 137 million cubic feet more than in the year 1905. So that the falling off is not very great, and certainly may be regarded as only temporary.

BASIS BROADENED AND STABLE.

Another thing which leads me to say it is not permanent is that we continue to extend the number of our supplies. Last half year we fixed 2765 more meters; and we had out on the district 1615 more stoves. We see, too, a tendency on the part of manufacturers to recognize the economy and the efficiency of heating their furnaces by gas, instead of other fuel; so I think we may expect to find in the future in our district that we shall extend our business a good deal in the way of supplies to furnaces. Of course, we have now a large number of coin meters on the district. I had hoped to be able to say we had 70,000 by this meeting; but we are just a few short of it. If the meeting had been a fortnight later, I should have been able to say we had 70,000; but the actual number is just short of that. This large number of coin meters, however, adds to the work and the responsibility of our staff; and the revenue is rather more expensive to collect. At the same time, we recognize that the basis of our trade is being broadened and our business is becoming more stable, because the small man who takes his gas through the coin meter is far less likely to leave us for a more expensive illuminant than his rich neighbour.

COIN-METER ROBBERIES.

You will perhaps have noticed that reference has been made in the public Press to the number of robberies of coin meters which are supposed to take place. It is quite true the number of robberies is considerable; but the amount stolen is insignificant. Our experience on the point goes to prove the truth of what I am saying. In 1907, we had 61,660 coin meters in our district, and had 2100 robberies—that is, nearly 3½ per cent. of the total number fixed; and the amount stolen was only £125. In other words, the average amount stolen from each meter which was broken into was only 1s. 2½d.; and this worked out to only ½d. per meter of the total number fixed. Last year we had 67,170 meters fixed; and there were 1775 robberies. We only lost £67 out of the whole number, which worked out to 9d. per meter broken into, or ¼d. per meter of the total number fixed. I think you will agree with me that this is not a very serious thing for the Company. We do not make bad debts of any moment at all through coin meters. On public grounds, we do our very utmost to secure convictions. That we are successful to a large degree, I think is shown by the fact that the number of robberies is decreasing every year in proportion to the number of coin meters we have fixed.

RESULTS OF HALF-YEAR'S WORKING.

Now I think I have mentioned everything that can be regarded as in any degree unsatisfactory; but there is nothing that is by any means serious. I will go for a minute to the accounts. I think you will agree that the results of the half year are distinctly good, taking into consideration the circumstances under which we had to do our work. The accounts bear evidence of much strenuous and conscientious work on the part of both your staff and workpeople; and I venture to say they reflect the greatest credit on our Engineer (Mr. Stanley Jones). One token of what I say is that the yield of gas per ton of coal carbonized is again at the very satisfactory figure of 11,435 cubic feet, which gas engineers will recognize is extremely good. The profit for the half year is £63,845, which is only £192 less than it was in the corresponding half of 1907. This is good, because it admits of the payment of our full statutory dividend, and gives us a surplus of £2499 to carry forward to the current half year. Added to the £18,488 of undivided profit which we brought forward from the previous half year, it gives us £20,988 with which to begin the half year upon which we have already embarked.

THE CAPITAL ACCOUNT.

Now, gentlemen, I generally go through the accounts; but really this half year there are no items to which I need call attention, except that I must allude to the capital account for just one minute. If you will turn to that, you will see it is overdrawn to the extent of £54,676. If you turn to the other side of the capital account, you will also see that there has been no expenditure during the half year on account of manufacturing plant of any kind. There has been very little expenditure on this head for a good many half years past; and I am able to say our manufacturing plant is so much ahead of our requirements that, unless something extraordinary takes place, resulting in a phenomenal increase in our sales, I do not think we shall have to spend much money on this head for some time to come. At the same time, capital will be required for the provision of stoves and coin meters, and the services which supply them. For this purpose, we shall need capital at the rate, I suppose, of somewhere between £15,000 and £20,000 a year. From these figures, you will see the issue of capital stock which I mentioned in August cannot now long be delayed; and we have, with that in mind, given notice of a resolution asking your authority to issue the balance of the stock authorized by the Company's Act of 1902 which now remains unissued. I need not say to you that both the Engineer and Directors watch the capital account with the greatest vigilance. We do our utmost to keep it down to as low a figure as possible, so that the charge for interest may not rise. In "Field's Analysis" for 1907, there are analyzed the accounts of the three Metropolitan Gas Companies and of some fifteen Suburban ones. It is seen that the proportion our capital bears to the sales of gas is exactly the same as the proportion of the South Metropolitan Company; and in each case it is £442 per million cubic feet. In fact, these two Companies are the lowest of all the fifteen Metropolitan and Suburban Companies, with the one exception of the Wandsworth Company, which has been admirably managed by Mr. H. E. Jones and his father before him for many years; and, besides, that has a district which is far more favourable for the sale of gas than the East-end district we supply. But this sum of £442 per million cubic feet includes the amount expended on ships and coin meters; without these two items it is only £371, which is a very low figure indeed. I think this bears witness to the fact that we have been very careful in the expenditure of capital; and it will give you confidence when I ask you to pass a resolution authorizing us to raise further capital as it may be required.

THE LOSS OF THE INDUSTRY.

I should not like to sit down without referring to the great loss the gas industry in general has sustained, since we last met, in the death of Sir George Livesey, the Chairman of the South Metropolitan Gas Company. You will recollect that he sat upon this Board for a few years; and only left it when his health necessitated his facing a very severe operation. We, his former colleagues and attached friends, have to mourn a personal loss; and I put it to you that every man who has money invested in the gas industry, and every consumer of gas who enjoys a cheap supply, owes to Sir George Livesey a deep debt of gratitude for the life-long battle he fought and the strenuous work he performed to ensure a cheap supply of gas. When I remind you that he was the author of the sliding-scale (which this Company was the first to adopt in 1875, whereby the dividend was made dependent upon the price of gas), when I further remind you that it was mainly owing to his great persistency and noble courage which refused to acknowledge defeat that the burdensome regulations with regard to the elimination of sulphur compounds from gas were removed, you will recognize something of the services he rendered to the gas industry. These, however, do not exhaust the list of his services; and I think that, in years to come perhaps, Sir George will be best remembered because he was the author of the co-partnership system, which has conferred so many benefits upon the working people employed in gas companies, and has made the workman the partner of his employers. His friends will remember Sir George because of his personal qualities, his loyal and true friendship, his wide knowledge, his magnificent ability, his frank and open nature—all these things endeared him to those who knew him; and a man such as he was, I venture to say, is one of Heaven's best gifts to his day and his generation, ennobling and uplifting all who come in contact with him by his example and influence, and showing that the common duties of daily life may be illuminated and transfigured by a high, lofty, and unselfish purpose. It has been decided unanimously by the gas industry to perpetuate the memory of Sir George by endowing the

Professorship of Gas Engineering and Fuel at Leeds University, which professorship he practically founded, and for the annual expense of which he made himself responsible during his life. His own Company, the South Metropolitan, have contributed £2000 to the endowment fund, and we are asking your sanction and authority to contribute the sum of 300 guineas for the like purpose. [Hear, hear.] I need not tell you, for you are practical men, that the gas industry in general—and we shall have our share in it—will derive considerable benefit from having a centre of research devoted to our particular requirements, and, further, we shall have a centre of training which will provide us with well-equipped gas engineers in the future; and this will, in some degree, recoup us for the contribution, and will be a distinct advantage to us. I think it was the new Chairman of the South Metropolitan Company (Mr. Charles Carpenter), whom we welcome to the position which he will most assuredly adorn, who said the other day that the industries of England in comparison with other nations had suffered from the want of scientific training. It was all very well, when we had no competition in the markets of the world, to muddle along as best we could. But we are no longer without competitors. All the nations of the world are competing with us now; and unless we, by strenuous work on scientific lines, can make ourselves fit for the contest, there is no doubt our country will fall behind in the battle of life.

CHARITABLE CONTRIBUTIONS.

This question of contributing a sum of money to the endowment fund brings me to the question of charitable contributions by joint-stock companies. In the old days, the business of the country was carried on by private firms; and an appeal to their generosity for charitable organizations was rarely made in vain. This, during the last century, was all changed. The business of the country passed to a large extent into the hands of joint-stock companies, managed by boards of directors, who are dealing not with their own money, but with the funds of others. Therefore appeals for charity to them are altogether on a different footing. At this Board, we have always considered ourselves at liberty to use the funds of the Company only for purposes which would bring back benefit either to the Company or our employees. With this principle in mind we have contributed small annual sums to various hospitals and societies, from all of which the employees derive untold help and assistance in the hour of their need. The total amount of our subscriptions is only about £200 a year, which is not too much for a great Company like this. I mention this in order that the proprietors may know what the Directors are doing in this regard; and I mention it because I am sure we shall have your hearty sympathy and cordial approbation of what we have done.

PROSPECTS.

I can only say, in conclusion, I believe the Company has a prosperous future before it, as it has a prosperous past behind it. We expect this half year to buy our coal and oil at considerably cheaper rates than last year; and we have already had a good many offers of first-rate coal at largely reduced prices. At the same time, we shall get a less price for the coke we sell. The new contracts for coal and oil will not affect the present half year very much. When, however, we meet you again in August, I think that we shall be able to present you with a revenue account which will not be unsatisfactory.

The DEPUTY-CHAIRMAN (Mr. Walter Hunter), in seconding the motion, said he joined very cordially and sincerely in the regret and the expressions the Chairman had used in regard to Sir George Livesey, to whom the gas industry owed such an enormous debt. He thought those who had the matter of a memorial in hand had done wisely in assuring the continuance of the professorship at Leeds University.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the rates per annum of £5 4s. per cent. on the 4 per cent. stock and of 5 per cent. on the 3½ per cent. stock, both less income-tax.

NEW STOCK ISSUES.

The CHAIRMAN next moved a resolution authorizing the creation and issue of 4 per cent. capital stock not exceeding in the whole the unissued balance authorized by the Special Act of 1902, and the relative amount of debenture stock similarly authorized. He explained that, under the 1902 Act, the Company were authorized to raise the sum of £300,000 by the issue of 4 per cent. capital stock, and as much debenture stock as would produce, after allowing for premiums paid on the capital stock, the sum of £100,000. That was to say, they could raise by the issue of capital and debenture stock a sum not exceeding £400,000. They had raised some portion of this, and asked authority to raise the balance as and when required. The Directors would put off the issue of stock as long as possible, and issue as little as they could do with.

The DEPUTY-CHAIRMAN seconded the motion, which was unanimously adopted.

Moved by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, the retiring Directors (Messrs. F. Green and H. E. Jones) were unanimously re-elected.

REMINISCENCES.

Mr. H. E. JONES, in acknowledgment, said he supposed there were few among the proprietors who had spent over 40 years in the service of a Company carrying on a large and important business such as this Company carried on in the East-end of London among the industrial classes there. They could therefore perhaps hardly conceive what any severance from that interest would mean to him. The figures of those associated with him in the early part of his connection with Metropolitan gas politics and administration, which was so long ago, had nearly all disappeared. He stood almost alone among those who could recollect what the Company were doing with Parliament and Parliament were doing with the Company, and the Company with their consumers, in the early sixties. This brought back to him the figure that had disappeared within the last few months—the figure of a man who was his early friend. He treasured the recollections of his acquaintance in the sixties. He called him, in his own mind, Livesey the Liberator. He liberated the whole gas industry from the limitation of profits and maximum dividends, which always had such a deadening influence on the progress of the industry. The stimulus to go in the direction of making cheaper gas when once the maximum dividend had been earned was then a very small one. But the institution of the sliding-scale which liberated the industry from that particular thrall resulted in dividends which were never anticipated, accompanied by reductions in the price of gas which had inured so much to the prosperity of the industry. He also liberated the industry from the tyranny of the Unions, which so often misdirected and misguided. He formulated the scheme of co-partnership. He also liberated the industry from those idle, chemical restrictions which he (Mr. Jones) found the most harassing of burdens for 25 years of his life. He also showed the value and importance to the administration of gas undertakings of having men with technical knowledge on the Board. He himself was a conspicuous illustration of the enormous value attaching to such men. He was a great man, of great intellect, of great resolution, and of indomitable courage.

On the motion of Mr. A. HARSTON, seconded by Mr. WILSHAW, the retiring Auditor (Mr. H. W. Gell) was re-elected.

Moved by Mr. M'NAUGHT, seconded by Mr. T. WILKINS, a hearty vote of thanks was passed to the Chairman and Directors.

The CHAIRMAN acknowledged it; and then proposed a vote of thanks to the Engineer (Mr. Stanley Jones), the Secretary (Mr. H. D. Ellis), their staffs, and the workmen. In the course of his complimentary remarks, he impressed upon the staff, through the Engineer, the necessity of preparing and equipping themselves for the increased competition there is in the battle of life nowadays.

The DEPUTY-CHAIRMAN seconded the motion, which was cordially agreed to.

Mr. H. D. ELLIS, in reply, said he was glad the proprietors were satisfied with the result of the half year which the Chairman had pointed out had been a comfortable one, without any brilliant incident. The Company had maintained the dividend and had added to the amount carried forward a sum of £2500, which was very satisfactory indeed. There was another matter that had received prominence in the last six months, and that was the broadcast issue of prospectuses of gas undertakings of a doubtful character, which were circulated largely among the shareholders of prosperous undertakings. Chairmen of several gas companies had warned shareholders not to subscribe to these companies without careful and independent inquiry; and he would ask every Commercial proprietor not to embark his money in any gas undertaking until he was sure of it.

Mr. STANLEY JONES, in his reply, remarked that the working of the half year had been extremely creditable; and he thought he could again tell the proprietors it was a record in the history of the Company. He attributed this largely to the co-partnership system, which was one of the greatest tributes to Sir George Livesey's memory.

This concluded the proceedings.

WEST HAM GAS COMPANY.

Excellent Advance of Business.

The Half-Yearly Meeting of the Company was held last Tuesday, at the Liverpool Street Hotel, E.C.—Mr. J. LISTER GODLEE in the chair. The proposed Scheme of Amalgamation with the Gaslight and Coke Company brought together a larger number of proprietors than usual.

The SECRETARY (Mr. A. G. Snelgrove) read the notice convening the meeting; and it was agreed to take as read the Directors' report and accounts.

The CHAIRMAN, in moving their adoption, said he must first refer to the unexpected death, after a very short illness, of their valued General Manager and Engineer (Mr. John Clark), which was a very great loss to the Company, and a cause of real sorrow to the Directors, who had worked with him so long, and had placed entire reliance and trust in his management of those affairs of the Company which came within his province. Mr. Clark entered the service of the Company about seventeen years ago as Consulting Engineer—very soon after the death of Mr. Thorman, who had been Engineer since its commencement. In that capacity, Mr. Clark's assistance proved invaluable; and, on the sudden death of Mr. John Thorman (who had succeeded his father), he took the place of Engineer and General Manager, and had in that position produced from the works the admirable results to which he (the Chairman) had so many times had to call attention. He was a highly qualified, loyal, trustworthy, and eminently straightforward and honest servant of the Company, to whose work all connected with it were deeply indebted. His loss would have been keenly felt at any time; and the proprietors would understand in what an especial manner the Board felt it in the present juncture of the affairs of the Company. The duties of Engineer had been entrusted to Mr. John C. Wright, who had been Assistant-Engineer for a long time, and had had an amount of responsibility thrown upon him in that capacity which the Directors believed thoroughly qualified him for undertaking the duties at the present time. He (the Chairman) wished to say a few words on other matters mentioned in the report and on the accounts; but, under the circumstances, they would be very few—leaving anything he had to say on the question of the agreement with the Gaslight and Coke Company till he came to propose the resolution dealing with this matter. In looking at the accounts, the proprietors would remember that the reduction of 1d. per 1000 cubic feet in the price of gas which he mentioned in August came into effect at Michaelmas, and made the gas-rental for the half year £2100 less than it would have been if they had been charging the higher price. The demand for gas had been less than had been expected, owing to the unusually mild weather which occurred before Christmas. The increase in the sales of gas in the whole year over 1907 was about 4·17 per cent.—a smaller increase than in recent years; the short demand during the winter having had its effect on this. There was in the past year an actual falling off in the amount of gas consumed through ordinary meters—not a consequence of any decline in the number of consumers by these meters (of whom there were 379 more than at the beginning of 1908), but no doubt

owing to the increased use of incandescent burners, and the smaller need for gas-fires this winter. At the same time, there were 5700 more consumers by slot meters, of whom, at the end of the year, there were more than 39,000; the ordinary consumers numbering about 23,000. The fixed capital of the Company now worked out at 11s. 10d. per 1000 cubic feet, as against 12s. a year ago, while the total manufacturing cost showed a reduction from 8·31d. to 7·1d. per 1000 cubic feet of gas sold. Some part of this was due to the alterations in purifying, consequent on the withdrawal of the sulphur clauses by the Act which the Company joined in promoting. The make of gas per ton of coal and oil was equivalent to 14,000 cubic feet, showing a small increase on the previous year, while the unaccounted-for gas had been very low, although slightly (less than ½ per cent.) more than in 1907. The cost of coal had been somewhat kept up by the fact that they had been using during part of the time coal received under the old contracts; and a fire in coal stored in the open had caused a loss of something like £500. The receipts from residuals for the year showed an increase of nearly ½d. per 1000 cubic feet of gas sold; but for the half year there was a reduction of nearly ½d. The total result of the half-year's working had been that they had to draw upon the amount carried over from the previous half year to pay the dividend. But, in addition to what he had already mentioned, it would be noticed that the dividend had to be paid on the whole of the money raised last summer, while £76,000 was still in the nature of floating capital, and was producing no income beyond interest from the bankers. Therefore, there was a reduction of £2100 in income, owing to the lowering of the price, and nearly £2000 more to pay in dividend than there was last year. He did not therefore think the result was one with which the stockholders need be dissatisfied. They saw the Directors proposed to pay the full dividend as there seemed no need, under present circumstances, to make any addition to the reserve fund. There was little else of general interest to which to call attention. Since the proprietors met last, the Directors had had a serious matter to attend to, and had had many meetings; but this related mostly to the matter which they would be considering in a few minutes, and, in the nature of things, other matters had been somewhat in abeyance. But nothing in this had interfered with the steady ordinary working of the Company's business.

The Deputy-Chairman (Mr. H. Cecil Pelly), in seconding the motion, said that, considering the reduction in the price of gas and the mildness of the season before Christmas, the profit made during the half year was most satisfactory. He should like to add his testimony to that of the Chairman at the great loss they had sustained in the death of their General Manager and Engineer.

The motion was unanimously carried.

Proposed by the Chairman, seconded by Mr. Fred. Nicholson, dividends were declared at the rates of 5 and 5¼ per cent. per annum on the preference and consolidated ordinary stocks respectively.

The Scheme of Amalgamation with the Gaslight and Coke Company.

Dissentient Voices—Resolutions for Amalgamation Carried.

The Chairman said as a matter of good order, he proposed now to deal with the agreement with the Gaslight and Coke Company for amalgamation, leaving the formal business—such as the appointment of the Directors and Auditors—until after this important subject had been disposed of. He had to ask the approval of the proprietors to the action of the Directors in a matter of supreme importance to the Company, in which matter they believed the step they had taken was one for the benefit of the proprietors and consumers. The proposal for the amalgamation with the Gaslight and Coke Company came to the Directors from that Company; and the statement in the circular addressed to the proprietors correctly stated the way in which the Board viewed the proposal. The Gaslight Company, finding themselves in a stronger position than they had been in for some time, with works sufficient to meet a much larger demand than was now made upon them, but with a district which contained no open country (as the Governor of the Company said lately, they felt "cabin'd, cribb'd, confined"), they were very anxious to obtain a more elastic district. On the other hand, the West Ham Company had a large district not yet occupied; with increasing demands being made for a supply of gas as fresh parts of it become occupied; and with works which had done, and were doing, excellent work quite sufficient for present demands, but affording little room for enlargement. The annual increase in their consumption during the years since the effect of supplying by slot meters came to be felt, had amounted to something under 10 per cent. The year that had passed had shown an exceptionally small increase, which the unusual mildness of the weather before Christmas did much to account for. Looking at the present manufacturing capacity, and the probable maximum demand in any day which this obliged them to provide for (the actual maximum sale in any one day this winter had been 8½ million cubic feet, and had several times exceeded 7 millions, and it was a question of probable maximum demand in any day, and not a question of average demand, which they had to deal with in this matter), and taking a very moderate estimate of probable increase, they were advised that, within three or four years, the Company must have a material increase in their manufacturing power. Some small increase might be possible at the present works; but he put this forward as showing that the starting of a new station was a matter of a very few years. He might add that to get such a station into good working order would take about four years, though they might be able to make some gas there in rather less time. The Board had, as the proprietors knew, for some time contemplated the starting of such a fresh station, and had made provision for this by the purchase of land at East Ham. But under Mr. John Clark's able management, they had been able to postpone the move up to the present—only erecting a gasholder there. They had already had under consideration steps for erecting a second gasholder, and should have begun the work with very little delay; and this alone would have cost them not less than £60,000. The expense involved in connection with beginning manufacture there, they were, of course, unwilling to undertake sooner than they were obliged. To start such a station would involve an expenditure in railway siding, dock, retort-house (which must have been large enough to make 2,500,000 cubic feet a day), purifiers, gasholder, with meter-house, shops, offices, &c., estimated by Mr. Clark, in a report presented to him (the Chairman) a short time ago, at about £250,000, which would require a profit of £12,500 to pay 5 per cent. interest. It was obvious that, though the extra amount of gas sold would be only that required to meet the increased demand that the existing works could not supply, yet a certain amount of expense in the way of wharves, railways, &c., would have to be immediately incurred, sufficient to serve the purpose of the works for a very long time; and the smallest manufacturing plant that it would be wise to set up must be sufficient to meet the demand for several years. Therefore, it must be a long time before the profit on its working would be anything like sufficient to pay the statutory dividend on the capital employed. It should also be kept in mind that a new manufacturing station involved a material increase in the expenses of management. This being the position of the two Companies, it appeared to the Board that a scheme by which the stockholders in the Company would be able to share in the profit of the increased business without the expenditure of this additional capital, to say nothing of the costs of an application to Parliament for additional money powers—and such applications often meant giving up something or other by the Company applying—and of the possible difficulty of raising this amount of money on satisfactory terms, was one that ought to be entertained in the interests of the proprietors and of the consumers, whose interests were so much bound up with those of the concern, and who would probably both have to suffer if it were found impossible, as it almost certainly would be, to earn the statutory dividend at the price then charged for gas. The terms of the amalgamation so far as they affected the proprietors and debenture holders were fully set out in the circular they had received; and he thought they would have found them satisfactory. He need not therefore repeat them in detail. In fixing these terms, the Directors put aside all questions of the price of the different stocks on the market, and looked simply to obtaining for the preference shareholders and debenture holders the same income as that which they were then receiving, and for holders of ordinary stock an income not less than that which they might hope to receive in this Company next August when the reduction of 1d. in the price of gas made last Michaelmas had been in operation long enough to authorize a dividend of £5 7s. 6d. per cent. The reduction in the price of gas charged by the Gaslight and Coke Company which was made this Christmas, and which the Board knew was going to be made, entitled them to pay a dividend of £4 13s. 4d. per cent., and £118 of their stock would thus give shareholders the expectation of somewhat more per cent. than they would have been entitled to look for from £100 of West Ham stock. Looking at the market value of the stocks of the two Companies at the time when these matters were under discussion, the price fixed would have increased the market value of the stock in this Company by more than £200,000. There had been a very great appreciation in the value of the stock since that time, following the announcement of the terms of the amalgamation—a fact which, in itself, seemed to show that shareholders and the Stock Exchange approved the step that had been taken. But, taking present prices, if the change took place to-morrow, it would increase the market value of the stock by about £100,000. From the stockholders' point of view, he thought the terms must be considered satisfactory, especially considering the present position of the Gaslight and Coke Company, which had greatly improved within the last few years. He was not proposing to go into this matter in detail. The price which their stock now held in the market showed that they had the confidence of the public; and the fact that within the last seven or eight years, while they had lowered the price of gas from 3s. 5d. to 2s. 9d., and carried large sums—about £90,000—to a depreciation account, they had increased their balance of undivided profit from £65,000 to £423,000, showed that their position had been materially strengthened. They had paid this half year their full dividend, and carried a further sum of £11,000 to the balance of undivided profits. He did not conceal from himself the fact that, to some of the older shareholders who had passed more or less of their lives in the parish of West Ham, and by whom the West Ham Gas Company had been looked on somewhat as one of their own local institutions, there was some regret associated with its name being lost, and merged in the larger concern. But this was not, he thought, a very practical objection and would have no weight with the large numbers of proprietors who had come into the Company in recent years, and had no personal connection with the West Ham district. It should not be allowed to influence judgment in considering a proposal which he had tried to show was so beneficial to the present holders of stock. In considering the position of the consumers, the Board had made it a *sine quâ non* that the price to be charged to them should not be raised as a mere consequence of the change. The price charged at any time was, under present arrangements, always liable to change as circumstances varied, and a large increase in the price of coal or any other increase in the cost of production might at any time involve an increase in price. They were now charging 2s. 8d.; the Gaslight and Coke Company, 2s. 9d. But the agreement entered into provided that, unless some event which they had not the faintest reason to anticipate should make it right for them (regard being had to considerations ordinarily affecting the price of gas) to raise the price before the end of the year, the price charged by the Gaslight and Coke Company to their general consumers should from that time be reduced to 2s. 8d.; and in any event that the price to be charged to the consumers of that Company should be the same as that charged, or which ought to have been charged, to the West Ham Company's consumers at that date. An idea had taken hold of a number of people, and had extended to some of the proprietors, that one result of the amalgamation would be the early closing of the present works at West Ham—an event which they all recognized would be a great calamity to the employees and to large classes of people in the neighbourhood of the works as well as to the borough as a whole. There had been some talk in this connection as to the extent to which the Gaslight and Coke Company had closed the works of the Companies with which they had amalgamated, as proof that the works at West Ham were likely to be closed after a short period. The Gaslight Company had amalgamated with eight other Companies possessing eleven different stations. Of these, one was closed within three years of the

amalgamation, because the site was required for the Thames Embankment. Three others were closed after 24, 28, and 30 years respectively; and all the others were still at work. He did not think this showed there was any reason for apprehension or anticipation that the works at West Ham would be shut up; nor did he believe that this was a practical danger. He had talked over the matter with the Governor of the Gaslight and Coke Company, and was assured by him that such an idea had never been seriously entertained by the authorities of the Company, and that, if it had been brought under consideration, it had only been to be dismissed as not tending to economy; that the proposal to amalgamate with the Company was based upon the plan of retaining the works of the Company, which had been doing excellent work, and supplementing their output by gas supplied from other works of the larger Company; that there was not any wish or intention to depart from this plan; and that, if the Gaslight Company hesitated to submit to a statutory obligation to keep the works on foot for a fixed term of years, it was from the feeling that, to accept such a clause, was to make the suggestion that they intended closing them at the end of that time, which they did not contemplate, joined with the disinclination of business men to bind themselves in fetters which, however light and easy they might seem now, yet might, before they were unclosed, become irksome and onerous by the force of subsequent events of which they had at the time no suspicion or anticipation. He believed the proprietors might entirely dismiss any fear on this score; and he would take this opportunity of saying that, when it became necessary to supplement the West Ham manufacture by gas made elsewhere, there seemed no doubt that such gas would be made at the Gaslight Company's station at Bromley, which was also within the borough of West Ham. The agreement provided for one of the Directors having a seat on the Board of the Gaslight Company, and for compensation for the loss of their offices (in which the proprietors would probably have retained them as long as they were willing to serve them efficiently) by the other Directors and the Auditors. The Gaslight Company were to take over such of the salaried officers of the Company as they required, and as should be willing to enter their service upon the terms of their subsisting engagements, subject to the same obligations as were imposed upon all officers of that Company to join a superannuation fund and guarantee fund, and were to compensate upon terms to be agreed on, or settled by arbitration, all officers whose services they might not require, and also any officers who, having been in the service of the Company for fourteen years or more, might be unwilling to enter the service of the larger Company. These terms were, he believed, those that were usual in such cases, except that they were unusually liberal in the provision of compensation for officers of long service not wishing to go over to the other Company. All existing pensions would be paid by the Gaslight and Coke Company; and in calculating future pensions, service in this Company would be taken into account. The other employees of the Company were not specially mentioned in the agreement; but, on the day of the amalgamation taking effect, they would pass into the employment of the other Company upon the same terms as they were employed by this Company, and would share in the benefits of the co-partnership scheme lately adopted by the Gaslight and Coke Company. There was a further provision in the agreement that, after consulting the Directors of the Gaslight and Coke Company, this Company might make gratuities not exceeding in the whole the sum of £5000 to any salaried officers of the Company whom they might consider specially deserving of it. The proprietors would, he thought, welcome this power of specially recognizing the work and service of certain of the officers. He need not trouble them with references to other clauses in the agreement working out the details of the transfer of one business to another, and certain temporary clauses dealing with matters which might arise between the present time and the amalgamation taking effect. It provided for the promotion by the Gaslight and Coke Company of a Bill to give effect to it, and retained power to either Company to require the Bill to be withdrawn if any substantial or material alteration or modification was made in it prejudicially affecting such Company, and for the payment of the costs of this Company by the Gaslight and Coke Company in any event. He had endeavoured to the best of his ability to lay before the proprietors the terms and effect of the agreement entered into, and the reasons which led the Directors to make it. It would be easily understood how much, in preparing some parts of what he had had to say, he had missed the help which he had hoped to receive from Mr. John Clark, with whom they had taken constant counsel while the negotiations were in progress. But he hoped he had succeeded in showing that the arrangement was a wise one for the Company to enter into, and that the agreement provided ample compensation to the stockholders, dealt fairly with the employees, and secured the interest of the consumers, and that the proprietors would be prepared to pass the resolution, which he had the pleasure of moving, for the adoption of the agreement.

The DEPUTY-CHAIRMAN, seconding the motion, said that, whatever might be the outcome of the present provisional agreement for amalgamation, the proprietors would, he was sure, give the Directors credit for having received the Gaslight Company's proposals with one, and primarily only one, consideration in view—viz., the benefit of the stockholders and consumers of the West Ham Company. It was from this point of view that the Directors had given it their most earnest consideration. In a scheme like this—of great public interest, particularly in the district affected—it was impossible to expect all concerned to agree as to its advisability; but he could assure the proprietors that the Directors had, throughout the negotiations, weighed most carefully all the interests involved—not only those of the stockholders and consumers, but of those whom the Company employed, and who had served them so well, and also the small shopkeepers and others more or less dependent on the works for their livelihood. With the assurances given—that the West Ham works would continue as heretofore—it was difficult to see how any local interests would suffer; while, from the stockholders' and consumers' points of view, it was hard to believe that they could do otherwise than largely benefit. With regard to the stockholders, they had already, as a result of the provisional agreement, a considerable appreciation in the value of their stock and an increased dividend both present and prospective; and, as regarded the gas consumers, the chances of any increased cost of gas under normal conditions would become very remote, while before they were extremely likely in the near future, owing to the large expenditure facing the Company at East Ham. There were, in his opinion, many good reasons for the amalgamation. Among others he would mention that the Company's capital under their Act of 1902 was so far expended that at latest in another year they would have to go to Parliament for increased capital facilities; a saving of expenditure would be effected on new plant at East Ham, estimated at over £200,000, a part of which—viz., the erection of a new holder—would have to be started this autumn; consequent upon this saving of expenditure, the present dividend was better secured, with good expectation of being increased; and the prospect was afforded of the present low price of gas to consumers being continued. All personal consideration had been kept out of these negotiations; but there were those, including himself, who could not but feel, with the greatest concern, the passing into other hands, and winding up, of the Company.

Mr. A. W. OKE protested against the resolution. While the proprietors had every confidence in the Board (who no doubt fully believed they were doing the best in the interests of the Company), he desired to point out a danger. The proprietors might select a company for their investment with every care; they might select their directors with the greatest care; and they might think the company in which they had placed their money was one that was going to develop and advance with the careful management of those who had been entrusted with the direction of the concern. But after all that, they might, as they had that day, have put before them a proposal to sell the undertaking to another company, and a larger company, without any mandate from the proprietors. They heard, too, that the Directors were to receive compensation; but it was not left to the proprietors to decide what the compensation should be, although the Board were their servants and trustees. When they remembered this, however good the intentions of these gentlemen might be (and this applied also to the officials of the Company), the proprietors could not expect them to look at this matter quite from the same impartial standpoint as men who were to receive no personal benefit. If this matter had been referred to some arbitrator or engineer of eminence, who would derive no benefit from the sale, they might perhaps have had a different story from the one then before them. The proprietors were in this peculiar position, that if they passed the resolution, they showed a disposition to sell. He believed he was right in saying petitions in opposition to the Bill had been lodged by several local authorities. If the resolution was passed, these local authorities might turn round and say, "You have shown a disposition to sell, and you must therefore sell to us." And Parliament might say, "If this Company do not wish to manage their own affairs, then it should be the West Ham Corporation, and not an independent outside Company like the Gaslight and Coke, who should step in and manage the affairs of the concern." Was it likely the West Ham ratepayers were going to let a good thing like this go by when the Gaslight and Coke Company were prepared to make a good offer for it? As to the price of the Gaslight and Coke Company's stock to-day, he believed he was right in saying that a few years ago it might have been bought at £83 or £84 per cent. He bought his at £107. But what guarantee was there that the price was going to remain at the high figure of to-day? He (Mr. Oke) feared there was a great deal of speculation in regard to this amalgamation. He himself had received a note from a broker suggesting that he should buy West Ham stock so as to get it exchanged into Gaslight and Coke stock. The dividend of the larger Company, however, was only £4 13s. 4d. compared with the £5 5s. of this smaller and well-managed Company. The Directors and officials were in the fortunate position that they were deriving a benefit. If the concern was wound up, it was right they should have compensation; but he thought they as proprietors should say what it should be. One member of the Board would have a seat on that of the Gaslight and Coke Company; and he believed that the position was worth something like £700 a year. The terms of the agreement were not disclosed to the proprietors until they received this notice; and they were not told what the compensation was to be. While the proprietors had been in the dark as to what was going on, the Board and the officials had been wideawake, and had taken the necessary steps to secure their position. While the Directors had done what they thought was best for the proprietors, they had placed them in a somewhat unfortunate position. If they could not have a continuance of their business, then let them have cash for their stock. The Chairman had foreshadowed a considerable expenditure; but it was expenditure that was incidental to all gas businesses.

Mr. BARNES remarked that according to the balance-sheet, after paying the dividend, the Company would have a balance of £21,454. What would become of that? It belonged to the proprietors.*

The CHAIRMAN said it did not belong to the proprietors any more than any other property of the Company.

Mr. DIPPLE understood that one of the reasons advanced for amalgamation was that the Company could not meet the demands without a large capital expenditure. He proceeded to quote a number of figures which, being averages, do not apply to the question of maximum daily demand and maximum daily production, with margin of safety. However, he concluded by moving that the offer of the Gaslight and Coke Company be declined with thanks.

Mr. RICHARDSON seconded the amendment.

Mr. DIPPLE further observed that the market price of the Company's stock stood at 117. Had any gentleman tried to sell at that price?

Mr. RICHARDSON said he had, but could not.

Another PROPRIETOR observed that he had had an offer of £116 for his stock.

Mr. TANNER remarked that he was sorry to find himself in opposition to the Directors. But he could not see the proprietors were under the scheme getting true value for their stock. He did not like the prospect of becoming a stockholder in a Company that he considered was much over-capitalized. It seemed to him if the amalgamation went through, the West Ham proprietors were likely to suffer, as he

* The proprietor apparently failed to understand that the Company can only divide up to the point that the Act allows. He also overlooked the fact that the Gaslight and Coke Company have also a large sum of undivided profit.

had before suffered from amalgamations, owing to the enormous capital of the Gaslight Company. Although the dividend on the stock they received might at present be a good one, there was no guarantee, with alterations in the prices of coal and so forth, that the dividend would be maintained; such largely capitalized companies always felt such fluctuations more than the smaller capitalized ones. As to the capital expenditure for the East Ham works, they only had a 4 per cent. increase in consumption last year; and with the electric light opposing, it did not seem to him they would be likely to want more plant for many years to come. With all respect to the Board, he could not see the proprietors would be benefiting by the proposed change.

The CHAIRMAN remarked that there was really not much for him to reply to. He was sure the proprietors generally would dismiss from their minds any suggestion that the Board had been influenced by personal consideration for their own pockets. Without any hesitation he could say that every Director of the Company would rather have retained his continuous salary than have taken the compensation he would get if the present scheme went through. It was not a great benefit to be turned out of an office in which decent remuneration was being obtained for a mere question of six years' compensation. As to the gentleman who became a Director of the Gaslight Company, he would have much more work to do than he had had upon the West Ham Board. Mr. Oke's suggestion that the Directors ought not to have gone to the point of negotiation, or that the scheme ought not to have been looked at by the Directors, without first coming to the proprietors, seemed to him (the Chairman) beside the point. The Directors were the persons to whom had been entrusted the management of the concern in great matters as well as in small ones. The Directors were the proper people to make, in the interests of the proprietors, a preliminary investigation of a matter of this kind, and to recommend accordingly. The proprietors could not expect the Board would refer to outside people the decision of a matter of this kind. Mr. Oke also seemed to think the Board had in some way got ahead of the proprietors. But they were there consulting the proprietors that day; and they were there asking them if they approved of the action the Board had taken. The proprietors were just as able to stop the scheme now, as they would have been if they had had the matter submitted to them earlier. Mr. Dipple's argument broke down with an average consumption taken over several months. Such an average had nothing to do with the question of the amount of machinery that must be provided for production. They must have sufficient producing power to meet the maximum probable demand of any day. It would be a poor consolation for the West Ham consumers, when asking for 8 million cubic feet or so of gas a day, if the Company turned round and said "We can only provide the average." The producing capacity to be provided for under present conditions was at least 7½ million cubic feet a day, and not 6 millions. The Company were quite capable of doing the work they had to do at present; and, indeed, the Board would have miserably mismanaged the proprietors' affairs if they had allowed the works to get into the condition of not being able to meet the demand upon them. They must have a margin of producing power; and unless they provided enough to carry them on for three or four years, they would not be doing their duty. Mr. Tanner did not agree with the Directors; and he thought they would be able to go on ten years or more before having to go elsewhere. The Board did not agree with Mr. Tanner.

Mr. RICHARDSON: What about the West Ham electricity opposition?

The CHAIRMAN said he was aware of that, and of the Corporation wanting to buy the gas concern while advertising that electricity was cheaper than gas. Gas was in a very safe position at the present time with regard to the opposition of electricity.

The amendment was then put and negatived by 26 votes to 24; while the original motion was carried by 31 votes to 26. Several shareholders abstained from voting either way.

Mr. OKE demanded a poll.

Mr. H. D ELLIS asked the Chairman whether he would inform the proprietors how many proxies the Board had on their side. If they had a predominating number, the proprietors need not, he thought, trouble over a poll.

The CHAIRMAN said they had proxies representing 6615 votes; while in the room there were only represented some 1800 votes.

Mr. ELLIS remarked that that was decisive.

Later in the proceedings, Mr. OKE withdrew the demand for a poll, remarking that they might rest content with the information as to the proxies.

FORMAL BUSINESS.

Moved by the DEPUTY-CHAIRMAN, and seconded by Mr. OKE, Mr. Godlee was re-elected to his seat at the Board; and on the motion of the CHAIRMAN, seconded by Mr. T. H. GEERE, Mr. F. W. Carter was also re-elected.

The retiring Auditor (Mr. W. Hopkins) was reappointed.

On the suggestion of Mr. F. G. PILLEY, supported by Mr. BEAUMONT, it was agreed that a letter be forwarded to Mrs. Clark, expressing the deep sympathy of the proprietors in her great loss, and their high appreciation of Mr. Clark's many years' good service.

Proposed by Mr. W. EDGAR, seconded by the Rev. T. TEED HEAVER, a vote of thanks was passed to the Chairman and Directors.

The proceedings, which lasted a considerable time, then terminated.

Winding-Up of the British Cerofirm Company, Limited.—A creditors' petition, presented by Messrs. Fry and Willson, for the compulsory winding-up of the above-named Company, came before Mr. Justice Swinfen Eady last Tuesday. The petition was supported by nine other creditors; and, there being no opposition by the Company, his Lordship made an order for compulsory winding up.

Gas Purchase Question at Northwich.—The Northwich Urban District Council have discussed the advisability of the town purchasing the undertaking of the Northwich Gas Company, the capital account of which is said to stand at £60,000. The opinion was unanimously expressed that such a scheme could only be carried out with the agreement of the Gas Company; and a deputation was appointed to interview the Directors of the Company.

WANDSWORTH AND PUTNEY GASLIGHT COMPANY.

The Cheapest Gas in London—All-Round Good Service—The Livesey Memorial Fund.

The Half-Yearly General Meeting of the Company was held last Tuesday, at the Company's Offices, Fairfield Street, Wandsworth—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. Chas. W. Braine) read the notice calling the meeting. The Directors' report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said there were a few points to which he desired to call attention in explanation of the accounts. He would go immediately to the one element in them about which the proprietors were, as a rule, most anxious. It would be seen the Directors recommended dividends at the full statutory rates. The Company worked under the sliding-scale; and the Directors kept on reducing the price of gas. But before they did this, they invariably saw that they would get a return of profit which would enable them to pay the little extra dividend to which the proprietors were entitled. This brought him to the most important announcement of all in the report, which was: "The Directors are pleased to announce a reduction in the price of gas—viz., 2s. to 1s. 11d. per 1000 cubic feet from Christmas last." This was perhaps the feature in the accounts which was most satisfactory of all, because, although they ultimately divided a higher rate of dividend, they could not get this until they had made an alteration in price to the consumers; and this last reduction, as one of the technical journals had said, put the Company in the proud position of supplying at a record price for London and the suburbs. Nothing below 2s. had ever before been accomplished in London or the neighbourhood; and, he thought he might add, in the South of England, leaving out the Plymouth and Stonehouse Gas Company. The advantage of this low price was that it inured to the stability of the business. It would readily be seen that if, by a rise in the price of raw material, an advance in the price of gas had to be made, the effect of raising by one or two pence a low price like 2s. was less irritating to the consumer than when the same addition was made to a higher price. At the same time, it was comforting to the proprietors to know they could maintain their dividends, and extend and maintain their establishment in good condition with such a low price for gas. Besides, in the competition with other modes of lighting, this low price was a very great advantage. He was reminded that the reduction of 1d. meant about £4000 a year to the consumers; and, following the reduction in price, the shareholders would get 2s. 6d. per cent. on part of the stock and 1s. 9d. on the other part. This would only cost about £400 a year. Therefore of the total sum required in carrying out these two things, the consumers got ten-elevenths and the proprietors one-eleventh only. Mentioning the dividend and the low price, brought him to another point. It would be seen from the capital account that they had over-spent the capital raised; the expenditure exceeding the receipts by £16,413. To meet this balance, they were having a sale of stock by Mr. Alfred Richards on March 16; and he did hope that there would be such competition for the stock, and such a price would be given for it by their shareholders, that the rather extraordinary position of their quotations on the Stock Exchange would be altered. There was no gas property in England (and he said this with a knowledge which would not be challenged) that was better than, and very few that were nearly so good as, that of the Wandsworth Company. Therefore there was no reason why the stock should be quoted with any disparagement to it when compared with the half-dozen Companies in London whose stocks were sold to realize to the investors not much more than £4 12s. 6d., or perhaps £4 15s. per cent.; and this was a superior investment to any of them. He had harped on this string at previous meetings; but he had himself been offered the stock from the Stock Exchange at prices which gave the investor 5 per cent. at least. This was a disappointment to him and his colleagues, as they had not brought, without constant thought and work, this undertaking to the position in which it was to-day—supplying gas at an extraordinarily low price, and yet paying a dividend which was continuously increasing without fluctuating at all—and to a point at which it was not necessary two years ago (when the price of coal was raised, and when nearly all the Companies round about London were increasing the price of gas) to advance their price, and yet they were able to pay their maximum dividends. He spoke with some emphasis upon this, because he wished it to go forth to the proprietors and the consumers generally that—even their own employees co-purchase it under the Act—the Company's stock formed an exceptionally good investment as a gas property; and when he said "gas property," he meant what must have been observed, that gas investments were to-day very much ahead of even railway investments, for the disturbances to which the railways were subject on various accounts were such as to put them behind gas stocks in the regularity and the stability of their maintainable dividend. The capital of the Company had been carefully spent; and this was the secret of their being able to sell gas so cheaply, and to pay so good a dividend, because it only required a very small amount—a trifle over 6d. per 1000 cubic feet of gas sold—to pay the high dividend the proprietors undoubtedly received. The figure would not be so light but for the fact the Company had a larger amount of property per hundred pounds of capital than any other company thereabout—indeed, he might say, hardly any company in the world. This said something for the administration by the Company's officers. The expenditure on capital account in the half year was £11,189; but of this only £375 was spent on buildings and plant. Rather less than £2500 was expended on mains, services, meters, and stoves. There was one item of £8370 for a ship. In this, the Company were pioneers of a new system, for they now brought coal from Newcastle to the river alongside their works, where they had a special derrick for the purpose of discharging the ship. This must lead to economy. It had, in fact, already led to economy. Up to now, they had been using a rather unsuitable old ship, which was bought from another Company. They used the boat for a time, and then exchanged it for a new one, part of the cost of which was seen in the item of £8370. With regard to the other expenditure, the proprietors would be surprised to hear what one of his colleagues (Mr. E. R. Ransome), who was an ardent statistician, told him. It was that since

1885 they had spent no less a sum than £150,000 upon those elements of their property which were purely for the consumers' benefit and facility—elements not of works and mains, but of meters, stoves, fittings, and things of that sort, which made the use of gas easy and convenient to consumers. That property was inside the houses of the consumers; and, what was of importance, it was not rateable. Before 1885, he did not think they had more than £30,000 in the same sort of property. When they considered that the whole of the capital was only, with the addition on conversion, a little more than £500,000, they would see how large a share the promotion of the economy and convenience of the ordinary householder took in their expenditure. They had not large manufacturing works in their district, and so they did not hire out machinery for special purposes; but incidentally he might say they were now allowing a discount of 15 per cent. off their price of 1s. 11d. for gas used for power purposes, which made the net cost to the manufacturer 1s. 7½d. per 1000 cubic feet. The dividends of which he had spoken would not be earned unless there was a substantial expenditure on the upkeep of the works and plant. In the items in the accounts of £10,429 on maintenance of works and plant, and £2805 on maintenance of mains and service-pipes, they had a sum which, calculated out, was considerably in excess of what was usually spent under these heads, and beyond the amount which he, as an engineer, knew would be quite sufficient to keep the works and plant in good order. It meant, however, that they had not been content with only keeping the works in good order, but they had kept them in the highest state of efficiency by adopting the most advanced and modern appliances. With regard to the receipts, the sale of gas was 7¼ million cubic feet more, or equal to 1·4 per cent.; and there was received for gas some £621 more. Rents of meters, stoves, and fittings also realized £403 more. The receipts for residuals deserved special mention. They fell as the price of coal fell; and sometimes in anticipation. But he was happy to say that, in the past half year, their officers had succeeded in producing enough from the residuals, by the study of the business and markets, to bring in £19,194, as against rather more than £20,000 in the corresponding half year when prices were higher. The total revenue of the six months was £81,488; and the total expenditure £67,584. He was glad to say that coal was falling in price. He knew some three or four companies who had bought coal at a decrease of more than 12½ per cent. on the price that they paid last year. In view of this, they might reasonably anticipate a further loss from the sale of residuals. But now that the market price of coal was going down, they would soon be able to take steps to secure their coal for the next year or two. This knowledge was gratifying to the Directors, and gave them assurance in deciding to reduce the price of gas to 1s. 11d. There was one other matter. The Directors had contributed to the fund for the establishment of a Professorship at the Leeds University for the investigation and research of the scientific problems concerning the use of gas and other fuels. This fund had been associated with the name—a precious name to personal friends and gas men like himself and his colleague (Mr. H. S. Freeman)—of Sir George Livesey. The proprietors all knew Sir George was a benefactor in what he did in solving difficult problems in connection with labour and capital. The Directors had therefore subscribed to the fund in the name of the Company, and they hoped the proprietors would ratify it, the sum of 100 guineas. For the fund, £10,000 was required; and he was sure the proprietors would sympathize with the Directors in thinking that, if the fund was found to be languishing, they might add a little more to the amount they had subscribed. In doing this, they were helping to perpetuate the name and honour of him whose services to the gas industry were many and eminent. Sir George fought a great battle and gained the supremacy of employers over some very turbulent and very destructive tendencies of certain labour unions; but he bore no resentment after the battle was over. He established the co-partnership system, which had not only proved capable of doing away with all friction and misunderstandings, but had gone far, not only in the gas companies with which Sir George first established it, but in several others, with some of which he (the Chairman) was connected, to make the relations of employers, staffs, and employees most pleasant, and had replaced indifference and slackness by alacrity and cheerfulness and energy, which had inured to the prosperity of the undertakings. In the Wandsworth Company, they had a system of their own, and were going to extend it in the same direction. They had at present certain arrangements with their men which were helpful towards saving and providing for old age. The Directors were now considering the matter, and would probably be able to report upon the extension of the system at the next meeting. There was one other satisfactory testimony to efficient working which should be mentioned. The last annual official report to the Wandsworth Borough Council stated that the average illuminating power of the gas in the year was 14·9 candles, which was slightly higher than the average for the preceding year (14·7 candles); and the average sulphur content other than sulphuretted hydrogen was 25·6 grains per 100 cubic feet. The Gas Examiner in the report remarked: "So far, therefore, the Wandsworth and Putney Gas Company compares favourably as regards sulphur impurities with the averages shown by the Metropolitan Gas Companies during the same period."

The DEPUTY-CHAIRMAN (Mr. T. A. Ives Howell) seconded the motion.

Mr. J. C. BADCOCK, C.B., among a few observations, pointed out that a complaint had been made in the local papers that, although the Directors were reducing the price of gas from 2s. to 1s. 11d. to the ordinary consumers, slot-meter consumers were still paying 3s. 4d.

The CHAIRMAN said the person complaining was singularly misinformed and ignorant. The slot-meter consumers were already getting a rebate of 6d. and would now be getting 7d. off the 3s. 4d. The consumer under the system was, in fact, getting 30 cubic feet for 1d., and would have handed back to him now 7d. for every 3s. 4d. found in the meter money-box by the collector. This system saved altering the coin mechanism every time there was a reduction in price.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN, a dividend at the following rates per annum was declared: 8 per cent. on the "A" consolidated stock, 6½ per cent. on the "B" consolidated stock, and £5 12s. per cent. on the "C" stock.

Proposed by the CHAIRMAN, and seconded by Mr. E. R RANSOME, the retiring Directors (Mr. T. A. Ives Howell and Colonel W. A. Jones) were re-elected; and moved by Mr. POTTER, and seconded by Mr. BIRD, the retiring Auditor (Mr. John Hennell) was reappointed.

The CHAIRMAN, having called the attention of the proprietors to the warning issued by the Directors against investments being made in rubbishy gas concerns promoted by persons who secured lists of shareholders in well-established undertakings merely by purchasing perhaps £5 worth of stock, proposed a hearty vote of thanks to the Secretary (Mr. C. W. Braine), the Engineer (Mr. H. O. Carr), their staffs, and the employees.

Mr. H. S. FREEMAN seconded the motion; and it was cordially passed.

Acknowledgment of the vote having been duly made, a similar compliment was paid the Chairman and Directors, on the proposition of Mr. BADCOCK, seconded by Mr. LEE.

BROMLEY AND CRAYS GAS COMPANY.

Concentrating the Manufacturing Plant at Bromley.

The Half-Yearly General Meeting of the Company was held last Wednesday, at the Bell Hotel, Bromley—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) read the notice calling the meeting; and the Directors' report and accounts were taken as read.

The CHAIRMAN moved their adoption. In doing so, he said that, having addressed the proprietors so fully on the details of the arrangements for the amalgamation of the neighbouring Company with their own at the three meetings that were held in reference to it last year, he need not make any further allusion to them that day, beyond saying that the experiences in the first half-year's working, and in the survey it had enabled the Directors to make, adduced satisfactory evidence of the wisdom of the course adopted, and of the equity as between the two Companies of the agreed terms, embodying as they also did the attendant advantages for the consumers in the economies of manufacture and in reductions of price to be developed. It would be recalled that, in one way or another, the accounts and statistics of the two Companies disclosed a substantially larger cost in the manufacture of gas at the Crays works, as not infrequently happened in the case of relatively smaller works for a comparatively less densely populated district. The Board at once concentrated their attention on this point, to find the best means of reducing the higher cost of one-fourth part of the total output to the common grade. After mature investigation of the possibilities of the modern adaptations of manufacturing plant and inspection of other works, and reviewing the distinctly preferential conditions attaching to the Bromley works, the Directors unanimously agreed to make them the manufacturing centre, and to erect there such additional plant as might be required to produce the supply for the whole area. The proprietors would, he thought, receive the announcement of the Directors' conclusions with the greater confidence from the fact that this conviction was equally established in the minds of their colleagues whom they co-opted from the Board of the incorporated Company. The additional quantity of gas for which provision had to be made was, to begin with, about 100 million cubic feet annually, raising the present total to 400 millions annually. The Directors, having had before them the express recommendations of their responsible adviser, the Chief Engineer (Mr. William Woodward), had from the tenders sent in accepted that of Messrs. Humphreys and Glasgow, for the erection of a plant, which, in combination with the existing efficient and up-to-date appliances at the Bromley works, would be capable of coping with the extensions of their business for many years to come. When these were completed, the manufacture of gas at Crays would be suspended, and the gas required for that section of the district would be driven from Bromley through a separate 8-inch main to be laid for the purpose, and which would also be available for any important branch supplies. The Board, being advised of the attendant advantages, had decided to use steel pipes for this main in lengths of 20 to 30 feet. The gasholders and all the distributing plant at Crays would be continued in use as heretofore; and they hoped, before the close of the year, the new service would be brought into operation. The approximate outlay on these and the subsidiary alterations and additions would probably be £15,000, of which a considerable part would be chargeable to revenue. Of course, they would utilize all the available plant at Crays by giving it place at the Bromley centre, and disposing of the non-adaptable. He thought the proprietors would doubtless receive this as an adequate explanation of the position in regard to the contemplated new works. With reference to the current business, they were not alone in having had only a moderate increase in the total make of gas for last year. The causes generally assigned for this were various—prominently, that the climatic conditions last year were more tolerable than usual. The explanation, however, was not quite exhausted. Candour prompted him to add that, in their case, possibly a recent competitor in the Crays district, introducing electric current for the first time, might have diverted some of the lighting which would otherwise have been from gas. Previous experience, however, proved that, while this new competitor was obtaining its portion of the business (for after all lighting by electricity was not everyone's luxury), their own rate of growth was but slowly retarded for the time; and when those who wanted the electric light were satisfied, the old rate of increase largely reverted to gas. The unsatisfactory item in the working expenses remained in the price of coal. Last year, coal cost 4s. 7d. per ton more than three years back. Generally when coal prices were high, coke was correspondingly remunerative; but the demand so slackened last year that prices dropped heavily as the accounts testified, for the year's deficiency really represented about £1400. They should be able to buy their coals this year at a much lower price; and they could do better still if the railway companies would give the Company lower rates, and keep the traffic, instead of driving them to transit by sea. While on this subject of coals, it might not be unappropriate to refer to the reduction made in the price of gas this time last year. The charge had been raised 4d. per 1000 cubic feet six months before. The coal contracts did not expire until the following June; and they then had an extremely high price. When the Council abstained from joining in the opposition

to the Amalgamation Bill, the Directors announced a reduction of 1d. per 1000 cubic feet as from Ladyday. When Ladyday came, there seemed some probability of much cheaper coal; and in the desire of the Directors to place the Bromley district consumers in the relative position in reference to charge contemplated in the Bill, the Company, on their own initiative, made a reduction of 2d. from that date. This reduction by 2d. was, events proved, a little premature; for the drop in coal prices was only very slight. Nevertheless, it was by way of explanation rather than of regret that he referred to it; for, though the ends might be said to meet with but little to spare on the accounts of last half year, the dip into the balance previously brought forward resulted more from the payments incidental to, and arising out of, the obtaining of the Act last year than from ordinary working. The Directors hoped to restore matters from the reduced price of coal in the year ahead. Did it not seem disappointingly contrary that their efforts to provide the district with a cheaper supply of gas, should again find reward in a notice for the reassessment of the undertaking, with the usual attempt to diminish the savings for the consumers by impounding those savings for the rates? But it was so. With regard to his customary analysis of the accounts, those of the past half year contained, for the first time, the results of the combined working, so the ordinary basis of comparison was removed. Moreover, they contained all the additional charges in regard to the negotiations and agreement for the amalgamation and for the Act to authorize it. They had now an insurance fund opened by the transfer of balances from the two contingency funds; and, by the way, they had an investment to effect on this account shortly. The reserve fund also included the balance of the Crays Company's reserve. The capital expenditure in the half year included £2857 for mains, part of the cost of additional mains laid to augment the supply in the northern area of the borough, where the number of houses had greatly increased. A summary of the financial position of the half year was as follows: The half year was entered upon with an undivided profit balance of £12,643, of which the dividends paid for the then ended half year absorbed £8893; leaving a balance of £3750 to carry forward. They closed the half year at Dec. 31 with a balance of £11,475, after payment of the additional expenses of the amalgamation and the Act. The dividends now recommended for declaration, stated in half-yearly terms, at the rates of 3 per cent. on the "A" stock, 2¾ per cent. on the "C" stock, and 2¼ per cent. on the "B" stock, would absorb £9261, and leave a balance of £2214 for the next account. He thought he might heartily congratulate the proprietors upon the sound and satisfactory position in which the Company now stood, with its amalgamated interests and its added business; its extended district, ripening for early development; and with insurance and reserve funds amounting to £12,800, in addition to the £2200 carried forward in undivided profits.

The DEPUTY-CHAIRMAN (Mr. Bertram H. Latter) seconded the motion; and, two or three questions having been answered, it was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. S. GEDGE, dividends were declared at the rates per annum of 6 per cent. on the "A" stock, 4½ per cent. on the "B" stock, and 5½ per cent. on the "C" stock, all less income-tax.

Moved by the CHAIRMAN, and seconded by Mr. HUGH WYATT, the retiring Directors (Messrs. A. S. Gedge, Edward Latter, and Alfred May) were unanimously re-elected. The retiring Auditor (Mr. A. S. Hicks) was also re-appointed.

The DEPUTY-CHAIRMAN remarked that those who were present at the meeting last August would remember that a resolution was passed authorizing the Directors to spend funds of the Company in providing a presentation of plate or otherwise to their Chairman, as some small token of appreciation for the work he did in negotiating the agreement for the amalgamation of the two Companies and in the after parliamentary work. The Company were fortunate in having a gentleman so capable of negotiating for them. When, however, they came to put the resolution into operation, it was found they were stopped by a little formality. There was a section in the old Companies' Clauses Act of 1845 which required that, when a subject of the kind was going to be dealt with in general meeting, notice should be given of it. No notice had been given of the resolution prior to the last meeting; and it was, therefore, now his pleasure, in the absence of Mr. S. J. Wilde (who moved the resolution on the last occasion), to propose an authorization to the Directors to purchase out of the funds of the Company a suitable gift of plate or otherwise, to be presented to Mr. Dickson as a token of the appreciation of the shareholders for the services rendered by him in negotiating the amalgamation agreement and in directing the Parliamentary Bill to effect its purposes.

Mr. ALFRED WRIGHT seconded the motion, which was carried.

The CHAIRMAN said he was sorry the absence of a little formality on the previous occasion had obtruded himself and his work for the Company a second time on the attention of the proprietors. He was, however, deeply grateful to his colleagues and to the proprietors for this kind expression of their appreciation of the services he had rendered. They were rendered from the heart, and without any thought of the aftermath. So far as they had contributed to the prosperity and solidarity of the Company, he was more than rewarded for anything he had done. As it was their pleasure to commemorate the occasion to him in this way, he thanked them very deeply for their kindness.

Special Meeting—Fresh Issue of Capital.

A Special Meeting was then held for the purpose of authorizing the creation of further capital.

The CHAIRMAN said that in 1906 the Directors were authorized to raise further capital. They were then in this position, that, under the Act of 1902, by a little oversight at the time, they were under the conditions of a clause which appeared to prevent them having power to offer for sale, by auction or tender, any portions of capital at a reserve price less than the nominal amount offered. This prevented them dealing with the "B" capital, because that capital commanded at the present time about £86 per cent. on its 4½ per cent. dividend; while the "A" stock was above par, and received a 6 per cent. dividend. When the Company obtained the Act last year, the Directors did what was necessary to correct the drawback, and to enable them to offer "B" capital at the market price. The proposal the Directors now submitted was that future requirements of capital be offered from the "B" stock. The capital represented by the "B" stock had in past years generally commanded a slightly relatively higher price than the "A"; and in recent times, within the last year or so, the transactions in the "B" stock had been very few indeed, so that quotations on the market were very doubtful—doubtful as to whether they represented what was the actual buying and selling prices of the stock if there were more of it floating through the market. They still believed that, when the "B" stock had a greater currency in transfer power than it lately had, the old conditions would be revived; and the Company would reap a greater advantage by the issue of the "B" than by the "A" stock. He therefore submitted that of the additional capital of £100,000 authorized to be raised under the provisions of the Act of 1902, an amount of £20,000 "B" ordinary stock be created, with power to the Directors to issue it as required.

Mr. FRANK STANGER seconded the motion; and it was unanimously carried.

The CHAIRMAN next moved a resolution authorizing the borrowing, in respect of the "A" stock issued or to be issued pursuant to a resolution passed on May 22, 1906, and of the "B" stock now authorized to be issued (including premiums), of one-third part of the amount so issued; the stock to bear a perpetual preferential interest of 3½ per cent. He explained that of the £10,000 of "A" stock authorized to be issued in 1906, £9000 was issued, and £1000 remained to be issued.

The DEPUTY-CHAIRMAN seconded the motion, which was also adopted.

Votes of thanks to the Chairman and Directors and to Mr. Woodward and Mr. Amos, their staffs, and the employees generally, were passed; and these acknowledgments concluded the proceedings.

READING GAS COMPANY.

The Annual General Meeting of this Company was held last Tuesday, at the Offices, Friar Street, Reading—Mr. J. OKEY TAYLOR, J.P. the Chairman, presiding.

The SECRETARY AND ACCOUNTANT (Mr. A. Canning Williams) having read the notice convening the meeting, the report and accounts were presented. In the former, the Directors stated that the past year, though not marked by any special feature, had been one of steady progress. The sale of gas had increased by 21,679,900 cubic feet (4·04 per cent.); the number of consumers had risen from 14,363 to 15,182; and 867 gas-cookers and 264 gas-fires had been added to the number on hire on Dec. 31, 1907. Reference was made to the lamented death of Sir George Livesey and to the proposed memorial to perpetuate his memory; and it was stated that the Directors had made a liberal donation to the fund—a course which they felt sure would have the hearty approval of the proprietors. The accounts accompanying the report showed that the income for the year was £99,271, and the expenditure £81,860; leaving a balance of £17,411 to go to the profit and loss account. The sum available for distribution was £27,712; and the Directors recommended the payment of dividends for the past half year at the rate of 5 per cent. per annum on the preference shares and ordinary stock—interim dividends at this rate having been declared in September last for the first half of the year.

The CHAIRMAN, in moving the adoption of the report, referred to the loss sustained by the Company by the death of two valuable members of the Board—Mr. Arthur Hill and Mr. John Egginton. To fill their places the Directors had, he said, chosen two gentlemen who had gained considerable business experience in Reading—Mr. G. W. Webb and Mr. George Philbrick—who they hoped would become effective administrators of the Company's affairs. Looking beyond their own domain, the whole gas industry had sustained a severe loss during the past year in the death of Sir George Livesey. They all knew how highly he was esteemed, and how widely his great abilities were recognized. He was a man who rose by sheer ability to a position of great eminence in his profession. Whether in a Court of Law or before Parliamentary Committees, he always expressed his views honestly as well as effectively; and they thereby commanded the greatest respect. He had not lived in vain, because his name was to be perpetuated in a very important institution in this country. It was proposed to establish a a memorial at Leeds University in the shape of a Chair of Gas Engineering and Fuel. If this was done, it would develop our own native talent, and give the younger generation an opportunity of acquiring scientific knowledge on all questions relating to the manufacture and combustion of gas. The gas industry were at present trying to raise a sum of money—which he sincerely trusted would be raised—equal to providing, as he had said, a Chair of Gas Engineering and Fuel at Leeds University with ample funds. The South Metropolitan Gas Company, which was one of the most progressive and the second largest Gas Company in the world, had generously contributed to the funds; and out of £10,000 or £12,000 required for the purpose, they had made the handsome donation of £2000, hoping that gas companies throughout the country would follow their lead, and subscribe in proportion to the funds at their command. Many subscriptions had been received; but he must say—and he spoke as a man who had had some little experience in connection with gas affairs extending over fifty years—that he was surprised that gas companies had not responded in a more liberal spirit. He considered it discreditable to certain companies that they had responded so niggardly to the appeal. The Directors had recognized their responsibility, being fully satisfied that it was a matter of vast importance to the gas industry at large, and therefore they had contributed the sum of 200 guineas to the fund. He was quite sure the stockholders would heartily approve of their action. Passing on to the accounts, the proprietors had only to glance through them to ascertain that the Company continued in a sound financial position. The capital expenditure had been kept down as low as possible; it had always been the Directors' policy to do this. It would also be observed that the revenue account showed highly satisfactory results. Turning to working, the Company had manufactured last year nearly 600 million cubic feet of gas—an increase of 20 millions over the previous year. When they considered that there were about

1227 empty houses in Reading, according to the figures given at the recent incorporation inquiry, and that in all probability nine-tenths of these houses had gas service-pipes in them from which the Company were not deriving any benefit, he had no doubt they would think this increase very satisfactory. Before concluding, he must congratulate their Engineer (Mr. Douglas H. Helps) upon the excellent results he had realized during the past twelve months, as they were higher than in any previous year. He had obtained upwards of 12,000 cubic feet of gas per ton of coal carbonized, and had beaten all previous records in this respect; and there were many other directions in which he had achieved excellent results. He (the Chairman) could assure the stockholders that the Directors recognized that when any work was entrusted to the Engineer it would be efficiently performed, and carried out in accordance with the most modern methods. He was ever on the alert and watching for improvements; and consequently the Directors always felt perfectly safe in giving effect to his recommendations. He (the Chairman) might also add that the Secretary and his staff had done most excellent work. The Auditors, in their report, testified to this in the most satisfactory terms.

The DEPUTY-CHAIRMAN (Mr. H. B. Blandy, J.P.) seconded the motion; remarking that he would like to add his testimony to the excellent services rendered by the Engineer and Secretary.

The motion was carried unanimously.

The retiring Directors and Auditors having been re-elected, a vote of thanks was accorded to the staff.

Mr. HELPS, in reply, said he desired to acknowledge the assistance he had received from the members of his staff, and also from the workmen. He thought he might say they were all working together most harmoniously to promote the welfare of the Company; for, apart from all other motives, it was to their interest to do so. As the Chairman had stated, the year had been one of steady progress, not only from the financial point of view, but also, in his opinion, and looking ahead, from a more important standpoint. He referred to the increasing confidence of gas consumers and gas shareholders in the advantages and prospects of the commodity they manufactured. The shareholders had certainly not been alarmed by the statements of the electricians that the adoption of metallic filament lamps had made electricity as cheap as gas lighting; and as regarded the consumers, the Reading and other gas companies continued to reinstate gas in premises where electricity had been installed. He thought the shareholders might help, when they had an opportunity of doing so, in combating the erroneous statements of electricians as to the unhealthiness of gas.

The SECRETARY returned thanks on behalf of the staff under his supervision, and also for the very kind remarks made with reference to himself. He said that during the past four years there had been an increase in the sale of gas of 78 million cubic feet and 3600 consumers, or a gain of three consumers per working day. Such a large increase naturally involved greater responsibility; but he welcomed this, because the natural inference was that the Company were going in the right direction.

On the motion of Mr. DRYLAND HASLAM, JUN., a vote of thanks was cordially passed to the Chairman and Directors.

The CHAIRMAN, in returning thanks on behalf of himself and the Directors, said his work as Chairman had been an interesting feature of his life, and therefore he was somewhat loth to give it up. He trusted he would be spared a little longer to carry on the work; and as long as he possessed the strength, it would always be a great pleasure to him to do what he could for the Company, with which he had been associated since 1856. When he first became connected with it, the price of gas in Reading was 5s. 6d. per 1000 cubic feet; and now there was every probability of it being down to 2s. 6d. before long. This was a remarkable reduction, the more so when one realized the fact that in those days, with gas at 5s. 6d. per 1000 cubic feet, gas companies could not get any profit out of the sale of gas; whereas now, with the price at 2s. 7d., they were paying full dividends, and were in a strong financial position.

The proceedings then closed.

TYNEMOUTH GAS COMPANY.

The Annual General Meeting of this Company was held last Wednesday, in the Board-room of the Company, Bedford Street, North Shields—Mr. J. B. WILLIAMSON, J.P., in the chair.

The report presented by the Directors showed that the revenue for the past year was £72,710, the expenditure £60,697; leaving a balance of £12,013. Adding the amount brought forward, there was a total of £19,704 available for distribution; and the Directors recommended the payment of a dividend for the half year ending Dec. 31 at the rate of 5 per cent. per annum, amounting to £5641. This, with the interim dividend paid at a similar rate, the dividend on the preference stock, and the addition of £1000 to the reserve fund, made a total of £11,986; leaving a balance of £7718 to be carried forward. The make of gas during the year showed an increase of 30,283,600 cubic feet, or 6·62 per cent., on that of the previous twelve months. The revenue from the sale of gas was £48,377, against £45,315; and from residuals, £20,854, against £20,433. The number of ordinary and prepayment meters in use at Dec. 31 was 19,032; being an increase of 1106 over the previous year. The Engineer (Mr. William Hardie) reported that the works and plant had been maintained in excellent order.

The CHAIRMAN, in moving the adoption of the report, reviewed the work of the Company in the past year. He said it was only the old story, but it was a very pleasant one, as it was one of continued progress and prosperity in all departments. This was the more marked, inasmuch as practically every industry, including gas, in the North of England had had to record a shrinkage, more or less, in revenue and profits. The reason for the continued progress of the Tynemouth Company was not far to seek; and it was to be found in the very low price of 2s. at which they were able to supply their principal product—gas. High prices had again ruled for coals; but the coke market had been favourable, while further economies in the cost of manufacture had been possible by the fact that early in the year the second half of the new retort-house was taken in hand—twelve new settings of retorts, on the regenerator system, being installed. These were charged with the automatic stoking machinery originally provided; and, together with the twelve previously in use, had supplied the whole of the gas required during the past six months. The largest make of gas sent into the town in one day was 2¼ million cubic feet, an increase of 263,000 cubic feet, or 13·79 per cent., over the previous record day. So it came to pass that with gas at 2s., less the usual discounts, ranging from 5 to 20 per cent., and used as it was in the incandescent burner, they had no difficulty in competing with every other form of light, in lowness of cost as well as in brilliancy. Great strides had also been made in the improved construction of heating-stoves and radiators; and they had been brought to such perfection in regard to economical working and efficient heating power that there again the Company were well to the front. The quantity of gas made during the past year was 487 million cubic feet, as against 457 millions in the previous year—an increase equal to 6·62 per cent.; and they received from it £48,377, against £45,315, or upwards of £3000 more. To produce this quantity of gas, 44,435 tons of coal had been carbonized, against 42,339 tons in the previous year—an increase of 4·90 per cent. Coals had cost £25,593, against £25,474, though 2000 tons more had been used. Residuals, which included coke, tar, and sulphate of ammonia, had been sold at satisfactory prices, and they had received for them £20,854, against £20,433—an increase of £421, or 2·06 per cent., and equal to 81 per cent. of the cost of the coal used. The number of ordinary and prepayment consumers gained during the past year was most satisfactory. There had also been a large number of cooking and heating stoves and radiators fixed, which had helped to swell the constantly increasing demand for gas. There were now in daily use 9242 of these stoves, of one kind and another, fixed by the Company, in addition to which many consumers provided their own stoves. It seemed probable that as the new works were now practically completed, and all extensions of mains required for the present to outlying districts had been laid, only a normal amount of capital expenditure might be anticipated during the next few years. The Company had made an excellent contract for coals for the ensuing year, the price being 1s. 6d. a ton less than the last contract, which represented something like £3000 on the consumption. He did not think, however, that they would get so much for their coke in the current year. The Chairman concluded by congratulating the officials upon their excellent work, especially referring to the Secretary, who, he said, was most assiduous in carrying out his multifarious duties.

The DEPUTY-CHAIRMAN (Mr. Shallett J. Crawford) seconded the motion; and it was carried unanimously.

The dividends recommended having been declared, and the retiring Directors and Auditor re-elected,

The CHAIRMAN moved that the salary of the Secretary (Mr. J. J. Carr) be increased by £50 per annum. He said that, in March, 1903, Mr. Carr's salary was increased by £100, when there were some 12,008 consumers. At the present time there were 19,032 consumers, or an increase of 7024.

Mr. J. TAYLOR seconded the motion; and it was carried unanimously.

At the close of the ordinary business, the shareholders authorized the raising of £30,000 additional capital; being part of £150,000 of new capital sanctioned by Parliament.

ALDERSHOT GAS AND WATER COMPANY.

The Company's Bill—The Proposed Supply of Electricity.

The Half-Yearly Meeting of the Aldershot Gas and Water Company was held on the 12th ult.—Mr. A. F. WILSON, the Chairman, presiding.

The GENERAL MANAGER AND SECRETARY (Mr. R. W. Edwards) read the notice convening the meeting; and the report and accounts for the six months ending Dec. 31 were presented. They showed that the total revenue was £31,230, and the expenditure £23,442; leaving a surplus of £7788. After providing for dividends on the preference shares, and interest on the preference stock, mortgage, and debentures, the Directors recommended a dividend at the rate of £11 19s. per cent. per annum on the "A" shares, £8 19s. per cent. per annum on the "B" shares, and 7 per cent. per annum on the "E," "F," and "G" ordinary shares, for the second half of last year, all less income-tax. They reported that, notwithstanding the mild autumn, the sale of gas (exclusive of contracts) showed an increase of 4·9 per cent. The War Department had further extended the use of incandescent burners; thereby economizing in the consumption of gas under contract.

The CHAIRMAN, in moving the adoption of the report and accounts, went in detail into the latter. He said the revenue from gas had slightly increased; the total for the half year having been £18,560, compared with £17,920 in the second half of 1907. The difference did not appear to be very considerable; but when the proprietors took into account the fact that during the past half year the Company had been supplying gas to the out-districts at a reduction of 2d. per 1000 cubic feet to ordinary consumers, of 2½d. per 1000 cubic feet to the slot consumers, and a reduction amounting to as much as 6d. to users of gas for power, heat, and cooking, the increase was very satisfactory. From their water they had had a total revenue of £5045, against £4927. Again the increase, though not considerable, was from general consumption, and could not be considered otherwise than satisfactory. With regard to the expenditure, there had been a saving of nearly £2000 in the cost of coal, brought about by careful economy in its use, and by strict attention to the purchase of the most advisable kind for their purpose at the best prices they could obtain. This reduction of nearly £2000 was extremely satisfactory. On the whole, they had a balance on their revenue and expenditure account of £7788, against £7269 for the corresponding period. This was satisfactory to the Board, because it had enabled them to pay maximum dividends, and put aside to the reserve fund the balance they had obtained. On the whole, therefore, they had no reason to be dissatisfied with the position they were in. Before leaving the accounts, he might add that the reductions in the price of gas affected them approximately to the extent of £1500 per annum. From various sources, continued the Chairman, it was necessary to consider

influences that were surrounding them and being brought to bear upon them in different directions, which rendered it advisable to apply for further parliamentary powers; and realizing the benefit of past extensions, they had no hesitation at all in considering a further extension where they imagined they saw additional sources of revenue. They cast their eyes for some time on the Hartley Wintney and Winchfield districts, for the extension of their area in this direction was a desirable thing; and, besides that, they were districts which really ought to belong to them. They had therefore framed a Bill for the present session which they hoped they would be successful in having passed. The Bill, if they succeeded, would give them an increased area of supply. Besides this, the Directors had felt that the time had arrived when they might not only be purveyors of gas light, but might also advantageously supply electricity within the gas area which in the out-districts they now occupied. They felt that in the development or generation of electricity, with the assistance of the gas-engine, they had great advantages over ordinary electricity companies in the power they had at their command. Of course, it entailed expense to bring a Bill before Parliament; and if they could get it passed with the least possible opposition, they would do a very good thing. At first they feared they would have considerable opposition; but he was happy to say they were sure now they had the very hearty support of the public. They had great reason to feel pleased that they had been accorded the support of the important bodies representing Aldershot, and that the Press had shown them sympathy. The out-districts had also not been backward. They had not had the same promise of full support that they had received from the Aldershot Council; but most of the bodies had been pleased that the Company were going on, and were satisfied they were going to do them no harm. Therefore, at all events, the Bill would not be opposed. After dealing with the financial proposals in the Bill, and suggesting the desirability, in view of the increase in the capital, of a Stock Exchange quotation of the Company's stock, the Chairman turned to their water supply, and said it continued to be satisfactory, both as to character and quantity. The supply had been an important matter to the Company, to the community of Aldershot, and to the War Department; and the purity and abundance of the water delivered by the Company was a source of satisfaction.

Mr. A. BROWN seconded the motion, which, after a few remarks, was carried.

The dividends recommended having been declared, the retiring Directors were re-elected; reference being made to the death of Mr. Henry Wells.

The meeting was then made special for the consideration of the Bill to which the Chairman had referred in his opening speech; and the motion approving of it was carried *nem. con.*

Thanks were accorded to the Chairman, Directors, and staff.

Mr. EDWARDS said the staff were loyal and zealous in the interests of the Company. The extra work thrown upon them the last few months in consequence of the Bill had been performed with great pleasure, as they knew it was in the interests of the Company. At the present time, and especially in the face of what the Board had to go through in the next few months, it was very encouraging to them to know that they had the support of the Urban District Council, the ratepayers, and the Press; and not only this, but that the out-districts were helping them. He hoped when they met again, in six months' time, they would be able to congratulate themselves on getting their Bill through as nearly intact as possible.

BARNET DISTRICT GAS AND WATER COMPANY.

Improvements at the Gas-Works.

The Half-Yearly Meeting of this Company was held on Friday, at the Holborn Restaurant – Mr. ALFRED H. BAYNES in the chair.

The SECRETARY (Mr. E. W. Drew, F.C.A.) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said he would content himself with placing before the shareholders a few figures comparing the results of the working of the half year just closed with those of the corresponding half of 1907. First with regard to the gas undertaking. The total amount of gas made during the last six months was 77,686,000 cubic feet, which was an increase of 4,466,000 feet; while the quantity sold was 70,363,000 feet, or an increase of 4,338,000 feet. There were 6816 tons of coal carbonized—56 tons more; the average make of gas per ton of coal being 11,397 cubic feet, which was a considerable increase on the previous year. The average cost of the coal was 7d. per ton higher—18s. 4d., as compared with 17s. 9d. Of coke there were 6491 chaldrons made, the average price received for which was 10s. 6d. per chaldron, as against 10s. 1d. The tar produced was 82,430 gallons. The average price received for sulphate was £6 4s. 1d. per ton, which was £1 1s. 5d. less per ton than in 1907. The returns for residuals altogether exhibited an increase of £273. The price of gas was 3s. 8d. per 1000 cubic feet. Rentals of meters, stoves, and fittings were £77 more; and the total receipts of the gas department amounted to £17,890, or an increase of £1182. On the expenditure side, it would be seen that during the past six months there had been an increase of £2030. Of this additional sum, £224 was for coal, £137 for carbonizing wages, £184 for rates, taxes, and management, £151 for meters, stoves, and fittings, and £1308 for repairs, maintenance, and renewals of works. The last item was due mainly to the reconstruction of the retort-settings. With the old settings, the consumption of coal was not in accordance with modern practice; and after careful consideration, the Board resolved to reconstruct the whole with regenerative furnaces arranged for mechanical stoking, and at the same time increasing the carbonizing capacity of the works. The cost of this work was, of course, a charge against their revenue. Unquestionably this alteration would prove economical in the saving of fuel and the increased durability of the retorts. The profit on the gas-works for the past half year, in consequence of this special expenditure, was £2730, or a decrease of £848. With regard to the water department, it was satisfactory to know that receipts from water-rates during the six months had increased by £1057, compared with the last half of 1907; the total income being £18,026, against £16,931. The water expenditure, at £8116, was £286 more; the increase being spread over a considerable number of heads. The profit on the water department and fittings was £10,075, or £848 more. The total profit on gas and water was £12,805; and from this had to be deducted for interest and income-tax £2378, leaving a balance of net profit of £10,427. The sum required to pay the dividends recommended in the report was £9434, which would leave a surplus of £993. Doubtless the shareholders would have observed the contingency account in the report, and would have seen that the Board had thought it prudent to transfer to the account from the balance in hand of accumulated profits a sum of £3000, charging to that fund the cost of the renewals of purifiers and condensers, and leaving a balance of £1162. In taking this course, the Directors felt confident they would have the cordial support of the proprietors. During the past year, 124 new service-pipes had been laid for gas, 358 for water, and 11 for public lamps; and the length of mains had been increased by 2489 yards for gas, and 6967 yards for water. The amount of water pumped during the six months just closed was 325,617,000 gallons, or an increase of 27,130,000 gallons. In the previous report, the Directors announced the retirement of their late Engineer, Mr. T. H. Martin, after a long and faithful term of association with the Company. It was also stated that to fill the important post thus rendered vacant, the Board had appointed Mr. F. J. Bancroft, the Engineer and Manager of the Hull Corporation Gas and Water Works. On this appointment, the Directors heartily congratulated the shareholders—feeling confident that by it the increasing progress and prosperity of the Company would be secured.

Dr. J. W. L. GLAISHER seconded the motion.

Mr. WILDASH inquired whether the unaccounted-for gas was above the normal.

The CHAIRMAN: The leakage is nearly 8 per cent. I believe it has stood at this figure for some time. As you know, it is a very wide district.

Mr. C. P. CROOKENDEN remarked that everybody was to be congratulated on the improved position of the gas department. It was perfectly clear that the shareholders would consider the Directors could not have done anything else than they had with regard to the contingency fund. He hoped it would be possible soon to do something in the way of reducing the price of gas. At 3s. 8d. per 1000 cubic feet, a large number of people would not use it for cooking and heating. In his district, where the price of gas was 3s. 10d., he had tried it for heating; but he had taken the stoves off again, as the cost was quite prohibitive. With the improved plant and more economical working he hoped the Board would see their way to reduce the price, as he was perfectly sure this was the only way to get people to use gas.

The CHAIRMAN: The question of price is constantly before the Board. They believe in the wisdom of reducing it at the earliest possible date, with due regard to the other interests. No one will be better pleased than the Directors when a further reduction takes place.

Mr. DYER said he was of opinion that, taking the size of the works into consideration, the present price could not be called excessive.

The resolution was then carried.

On the proposition of the CHAIRMAN, seconded by Dr. GLAISHER, dividends for the half year, less income-tax, were declared at the rate of 7½ per cent. per annum on the "A" and "C" stocks, 6½ per cent. on the "B" stock, and 5¼ per cent. on the "D" capital gas and water stocks.

The retiring Directors (Messrs. Alfred Lass and A. F. Phillips) and the retiring Auditor (Mr. C. P. Crookenden) were re-appointed.

Mr. A. F. PHILLIPS proposed a vote of thanks to the officers and staff, all of whom he said loyally served the Company. In Mr. Bancroft the Company possessed an able Engineer, who was thoroughly conversant with the administration of both gas and water works. He was also what the Company very much required—a good organizer. Since he had been at Barnet, he had had an anxious and busy time; but he (the speaker) felt confident the Company would eventually derive considerable benefit from his services. He was now developing the gas consumption in a way that had not been done for some years past. Though the district was a scattered one, there was no doubt that under Mr. Bancroft's administration they would very soon see an increase.

Mr. JAMES L. CHAPMAN seconded the motion, which was cordially agreed to.

Mr. BANCROFT, Mr. DREW, and Mr. WRIGHT, the Cashier, acknowledged the vote.

On the proposition of Mr. ALEXANDER DICKSON, seconded by Mr. SAMUEL CUTLER, a hearty vote of thanks was accorded to the Chairman and Directors; and with the CHAIRMAN'S acknowledgment the meeting closed.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY.

Progress of Both Illuminants.—Further Capital Authorized.

The Ordinary General Meeting of this Company was held last Tuesday, at the Offices, No. 50, Cannon Street, E.C.—Mr. JOSEPH MANWARING in the chair.

The SECRETARY (Mr. W. A. Schultz, F.C.A., J.P.) read the notice convening the meeting and the minutes of the previous meeting; and the report and accounts were taken as read. These showed, for the year ended Dec. 31, a profit on the gas account of £4434, and on the electricity account of £32. After providing for every charge against the year's working, and interest on mortgage debenture stock and loan, and the payment of an interim dividend at the rate of 5½ per cent. per annum for the half year ending June 30, and setting aside a sum of £419 for reserve for renewal of plant, there remained a balance of £2102 at the credit of profit and loss account, out of which the Directors recommended the payment of a dividend at the rate of 5½ per cent. per annum for the six months to Dec. 31; leaving a balance of £200 to be carried forward.

The CHAIRMAN said the past year was one which had marked a new

era in the history of the Company, and which some of them who might call themselves veterans in the gas world must have looked forward to with a certain amount of anxiety, though without undue concern, as the Directors felt sure the step they had taken in the interests of the Company in applying for powers to supply electricity was one which was bound eventually to lead to greater prosperity. They occupied the position of being the first gas company who were able to present to their shareholders revenue accounts for gas and electricity for a whole year on the same sheet. At first, their friends shook their heads doubtfully as to the expediency of the Company embarking on electricity supply; but if they might regard imitation as being the sincerest form of flattery, they could point with satisfaction to the fact that there were to-day at least two other companies who were applying for similar powers. The past year had not been considered a favourable one for gas companies generally. The weather had been elusive, and other circumstances had combined to retard the progress of the output. While therefore they might have expected some diminution in the sale of their gas, they had, as a matter of fact, such a very small reduction to record that it was hardly worth while noticing. If, however, they took the gas and electricity combined, they had an increase in the joint undertaking of £500. The past year had borne the whole brunt of the increased price of coal; for it would be seen that coal had cost them £457, or about 11 per cent., more than in the previous twelve months. Against this, however, there had been an increased yield of £150 on coke, and of £136 on ammoniacal liquor and sulphate. The yield of tar showed a falling off of £22. The management expenses had for the past year been divided up between gas and electricity, not in proportion to the business done, but in proportion to the capital expended. Under this arrangement, the Gas Department had been relieved of about £250, which charge was borne by the Electricity Department. Of the electricity revenue, amounting to £609, £436 was for the latter half of the year, and £173 for the former half; and owing to the management charges to which he had just referred, the account showed a loss of £97 to June 30, and a profit of £129 for the latter half of the year—resulting in a small profit for the year of £32. The standing charges, therefore, being at their maximum, all increase in the yield of current would result in a far greater proportion of profit; and he was very hopeful that next year the Directors would be able to report a net profit which would bear a reasonable proportion to the capital expended. Under these circumstances, he thought he might close by congratulating the shareholders upon the success with which the Company had turned the corner, and upon the fact that the undertaking showed evident signs of being on the path to greater prosperity. He moved the adoption of the report and accounts.

This was seconded by Mr. ALFRED KITT, who expressed agreement with what the Chairman had said as to the future of the undertaking. He said he was quite sure that this year a very much larger profit on the electrical side of the accounts would be shown.

Mr. SAMUEL SPENCER remarked that he was glad the Directors had been able to maintain the 5½ per cent. dividend, and hoped the supply of electricity would prove to be of as much benefit to the Company as they thought two or three years ago would be the case. The capital expenditure of £20,000 odd on the electricity department which was shown in the accounts was, however, somewhat of a surprise to him. He believed the Electrician did not think it would require more than £15,000 to put in the installation; and if this was the case, it seemed that they had terribly "outrun the constable." He asked whether the capital account was closed as regarded any large expenditure on the electricity works. This £32 profit on an outlay of £20,000 was so miserable that it almost frightened one. He hoped they would do better this year, and not find that electricity had proved detrimental to gas. He would be glad to know how many electric lamps had been connected.

The SECRETARY said that somewhere about £15,000 was the estimate for the electricity plant and the necessary cables. When the first accounts were audited last year, the Auditors required, in accordance with the Act, that a certain proportion of the expenditure on land and buildings which had hitherto been charged to the Gas Department should be transferred to the Electricity Department. This, of course, was merely a transfer of items, and not a further expenditure. This explained a portion of the increase shown in the accounts; and then there had also been some work done beyond the contract of £15,000. The equivalent of 8-candle power lamps connected was 5486; and there were 1000 more now in hand or in contemplation. The Company had at present 14½ miles of main cable laid.

The ENGINEER AND MANAGER (Mr. A. E. Brooks) said the only additional capital for the electrical undertaking that would be required would be for ordinary extensions in the distribution branch. Their maximum output as yet had been 35·4 kilowatts; but they had two machines and all the plant necessary to produce 50 kilowatts each. Thus the expenditure on new works would be comparatively little for some time to come.

The SECRETARY, referring to the capital expenditure, added that he did not think the future need be regarded with apprehension. The electricity profit on the present occasion was, it was true, only £32; but, as the Chairman had explained, £250 was really only a transfer of the obligations of the Gas Department, which would have remained even if the electric light had not made its advent. So that, as a matter of fact, the profit, though not shown in figures, was about £280.

Mr. C. A. MORGAN asked whether the reserves shown in the balance-sheet for doubtful debts and renewal of plant were invested outside the business; and also whether the stocks had been carefully gone over, as the figure seemed rather heavy, considering that there were only about 590 tons of coal in hand at Dec. 31.

The SECRETARY said the reserve for the renewal of plant was made up of the sum allowed by the Income-Tax Commissioners to be set aside for this purpose. For the last three years an amount had been put aside out of the profit and loss account; but it was not specifically earmarked or invested. It was used in the business. Actually they had an overdraft at the bank of £6500; and this must be reduced by an increase of capital. The stocks were carefully valued by the Engineer, and checked in the office, as well as by the Auditors.

The resolution was then carried unanimously.

Mr. F. R. SMITH, in moving that a dividend at the rate of 5½ per cent. per annum for the half year, less income-tax, be declared, said that in his opinion the Company had done a very wise thing in taking up the supply of electricity. If they had not done it themselves, someone else would. The capital expenditure might look large to-day; but as years went on, he believed they would find the money had been profitably invested.

Mr. SPENCER seconded the proposition, which was agreed to.

Mr. HENRY WOODALL was next re-appointed a Director; and in returning thanks, he remarked that Mr. Smith had referred to the wisdom of the Company in taking upon themselves the supply of electric light. At one time he (Mr. Woodall) was less optimistic in regard to this business than the other members of the Board; but he must confess that he was becoming more and more assured that the step was a wise one, and that it would result in very material profit to the concern in the future, besides adding to the stability of the whole undertaking. One point that could not come out in the balance-sheet, but which was most material in the consideration of the matter, was that in having no competition between the gas undertaking and the electricity undertaking they saved an amount which, from his own experience, he could say was not less than 2d., and would probably run to 3d. per 1000 cubic feet. Where two companies competed, they did not know which was going to give the greatest largess to the user. The electric light company would begin by sending out free fittings, then they would give free wiring, and so on; and the gas company would have to offer something in reply. Competition of this kind was a great injustice to the general consumers. It meant that the prospect of reducing the price of gas was put further back, because all the profits were being given to users that they had had no previous connection with. Thus both the gas company and the electric light company were losers; and the old consumers were also losers. Now, placed as they were, they saved all this money which would have been so extravagantly wasted, and which might be put down as at least £300 a year.

The Auditors (Messrs. T. A. Welton, F.C.A., and Dr. H. J. Strong) were re-elected; and the Chairman, Directors, Secretary, Engineer, and staff were thanked for their services—a compliment which was duly acknowledged by Mr. MANWARING, Mr. SCHULTZ, and Mr. BROOKS.

At an Extraordinary Meeting which was subsequently held, the following resolution was proposed by Mr. SPENCER: "That the Directors be authorized to raise additional capital by the issue of 750 £10 ordinary shares."

Mr. S. WEBB, in seconding, asked whether it was proposed to issue the shares by auction or tender. Personally, he preferred the auction system, and he thought most people did.

The CHAIRMAN said the shares would be issued by auction; and the resolution was then carried unanimously.

PROVINCIAL GAS AND WATER COMPANIES.

Gas.

Progress at Annfield Plain.

The first report of the Annfield Plain and District Gas Company, with the accounts up to Dec. 31, which was presented at the meeting last week, stated that the Burnopfield works were taken over by the Company on Dec. 11, 1907. The principal works at Kyo and Dipton were taken over from the vendors as at March 31, 1908, and the purchase was completed on June 29, in accordance with the Annfield Plain and District Gas Act, 1907. The Company had therefore received the revenue for the nine months to Dec. 31. The revenue account showed a profit of £1453. After payment of interest on mortgage debentures and loans and interest to the vendors pending completion of purchase, and also the small interim dividend on the preference shares taken up prior to June 29, 1908, there remained a sum of £830 at the credit of profit and loss account. Out of this, the Directors had paid the dividend on the preference shares to Dec. 31, and recommended the payment of a dividend for the year of 5 per cent. on the ordinary shares, leaving a sum of £79 to be carried forward. The number of consumers had increased from 852 at March 31 last, to 1808 at Dec. 31. Considerable work had been done in the way of further mainlaying and necessary additions on the works during the past nine months; and with this in view, the Directors considered the result stated was very encouraging. The Chairman (Mr. W. A. Schultz, F.C.A., J.P.) remarked that when the vendors took over the works there were 469 consumers; and these had increased to 852 when the Company took possession. It was then anticipated that there would be a large addition to the number of consumers; but the progress made had exceeded even their own expectations. Since December there had been still further customers added. The carbonizing was showing better results now than at first, as the works had been got into thorough order, and the Manager (Mr. C. L. Ireland) had been able to obtain a better yield per ton. The only weak spot was the unaccounted-for gas, which was explained by the fact that there had recently been several subsidences owing to mining operations. Much of this loss had been stopped; but, of course, they could not hope to get the leakage down to the low figure which prevailed in more ordinary districts. Their Engineer, Mr. Shapley, had spent some time on the spot examining the mains; and he was now engaged in remedying defects wherever they had been discovered. Their consumers were of the kind who used a comparatively small quantity of gas; and the majority of them were on the prepayment system, so the risk of bad debts was reduced to a minimum. Since the acquisition of the works, the sum of £8133 had been spent on capital account, nearly half of which was due to the expenses of the severe opposition they were subjected to while their Bill was in Parliament and the cost of the arbitration proceedings. These, so far as ascertained, amounted to £3485. The remaining capital expenditure had been entirely for extensions. They had increased the return from coke from 5s. to 10s. per ton; but, of course, during the nine months they had had to bear the full brunt of the high price of coal, though for the coming year they had made a coal contract at 1s. 3d. per ton less. He felt justified in congratulating the shareholders upon the results that had been achieved. The report was adopted.

Satisfactory Improvement at Cork.

At the ordinary general meeting of the Cork Gas Consumers' Company last Thursday, the Directors reported that there had been a small increase in the gas-rental in the six months ending the 31st of December, compared with the corresponding period of 1907. The balance on the profit and loss account was £5541; and the Directors proposed to pay a dividend at the rate of 8 per cent. per annum, which would necessitate the withdrawal of £14 from the reserve. The Chairman (Mr. George Lynch), in moving the adoption of the report, said the Company's business continued to improve satisfactorily, though the credit balance for the past half year was not quite so large as usual. This had been caused partly by the unusually mild weather that prevailed in November and December, and also by the lower prices ruling for all the residuals. The Company were now feeling more keenly the effect of the new and improved incandescent lamps, by which more light was obtained from one, burning less gas, than from two or three of the old flat-flame burners. Though this checked for the present the large increase they would otherwise have had in the consumption of gas, they did not object to it, as it still further established the superiority of gas over every other illuminant. The public seemed to be appreciating more fully the advantages of gas for cooking and heating, as shown by the continually increasing demand for these purposes; there being 2369 cooking-stoves and 2210 heating appliances of various kinds now in use. The Company had recently obtained a contract for ten years from the District Council for lighting the Bishopstown division of the city. Mr. F. W. Mahoney seconded the motion; and it was carried unanimously. The dividend recommended was then declared, and the proceedings closed.

Increased Trading and Official Changes at Exeter.

At the annual meeting of the Exeter Gas Company on Monday last week, the Directors reported that the sale of gas had increased during the past year by upwards of 8½ million cubic feet, the demand by private consumers being well maintained. They recommended the payment of the usual dividends—*i.e.*, 10 per cent. per annum on the £40,000 original stock, and 7 per cent. per annum on the £46,500 new ordinary shares—together with such additional dividend as would reimburse shareholders deductions for income-tax on dividends; and that the balance of the profit for the year should be carried to the reserve fund. The Directors expressed their regret to report that Mr. W. A. Padfield, who had for very many years been associated with the Company as Engineer and Secretary, had tendered his resignation of these positions. In consideration of his valuable services, they had granted him a life pension, and had elected him to fill the vacant seat on the Board. They had appointed Mr. William Netherway Westlake, who had for several years been Assistant-Secretary of the Company, to the position of Secretary and Manager, and Mr. Frederick Wood, the foreman of the works, to be Works Manager. In moving the adoption of the report, the Chairman (Mr. G. H. Harris) drew attention to the large increase in the trading of the Company. He also dwelt upon the fact that they had reduced the price of gas to the general consumer by 2d. per 1000 cubic feet, which represented £2400. There were now 10,000 meters in use in the city. The additional gas used by ordinary consumers was equal to 5½ per cent., and the increase in the consumption by cooking-stoves was 9½ per cent. The Chairman drew attention to the retirement of Mr. Padfield, who, he said, had been associated with the Company no less than 37 years, during which time he had rendered very great service. He carried with him the good wishes of the Board on his retirement; and they were glad to have the opportunity of securing the continuation of his assistance and advice as a Director. Having alluded to the official changes consequent upon Mr. Padfield's retirement, as mentioned in the report, he put the motion, and it was carried unanimously. On the motion of Dr. Dangar, seconded by Mr. Higgs, it was resolved to place on record the high appreciation by the shareholders of the efficiency, skill, and the marked success with which Mr. Padfield had discharged the duties of Engineer and Secretary during the long period of 37 years for which he had been associated with the undertaking. The vote was acknowledged by Mr. Padfield, who referred to the changes which had taken place during the time that he had been connected with the Company, and the marked progress which had been made in its affairs. He felt that the time had arrived when he might fairly take a little rest, and therefore he had decided to retire. He greatly appreciated the compliment the Directors had paid him in electing him one of their number, and should always be happy to do everything in his power to promote the interests of the undertaking. Thanks were also expressed by Mr. Westlake for the confidence that the Directors had shown in him in appointing him Secretary in succession to Mr. Padfield, with whom he had been associated many years, and to whom he was much indebted for the kindness he had always extended to him. The dividends recommended were then declared; and the re-election of the retiring Directors and Auditor and the passing of a vote of thanks to the Chairman for presiding brought the meeting to a close.

Electric Light Competition at Ipswich.

Moving the adoption of the report and accounts at the annual meeting of the Ipswich Gas Company yesterday week, the Chairman (Sir Daniel F. Goddard, M.P.) said the past year had been one of good, steady progress, notwithstanding the very severe competition to which they had been subjected. They had as many as 14,925 consumers, which was an increase of 288. The revenue from the sale of gas also showed an increase of about £700, which was largely due to the popularizing of gas and bringing it within the reach of those more humble who, but for the Company's methods, could not use gas. In evidence of this, he might say they had 6300 gas-cookers regularly in use. In addition, there were the gas-fires. It was impossible to give the exact figure as to these, because they were sold and not hired; but there must be something over 4000 in use. The sales of gas during the year had amounted to 429,600,000 cubic feet, an increase of 6 millions over the previous year, or 1½ per cent. They had been able to make 10,972 cubic feet of gas per ton. This was a record figure in the history of the Company, and was a creditable performance on the part of Mr. Frank Prentice, the Works Manager, and the staff who had control of the production of gas. The sale of gas was another record figure, at 10,480 cubic feet per ton, which showed that the department which looked after the mains and the general outdoor work had been highly efficient. The leakage was only 4·8 per cent. They would see from the balance-sheet that the cost of coal and oil had increased by £2002—an increase entirely due to the rise in coal, which went up from 15s. 2½d. to 16s. 2½d. per ton. Residuals, however, realized so well that the net cost of coal, after deducting the value of residuals, was slightly less than in the previous year. They had lost a certain number of customers on account of the electric light; but, as the figures he had quoted showed, they had made up for that loss in the sale of gas. More gas had been used for heating and cooking in the town—a department not so readily met by their competitors. In power purposes, also, they had been able to hold their own against the municipal electricity supply. Several customers had had to determine what form of power they would use in their undertakings; and, notwithstanding the exceedingly favourable terms offered by the Corporation, they had decided upon gas. He might give a word of advice to those gentlemen who managed the affairs of the town, and posed as economists. They ought to study the accounts of the Ipswich Corporation electric light supply very carefully, because if they did, he thought they would be inclined to adjust their prices so that no loss occurred to the ratepayers. There was plenty of room for both; but he did not think it was creditable to those who, after taking money out of a ratepayers' business, tried to run down the business of those who put money into the ratepayers' pockets. When it was borne in mind that the gas undertaking contributed over £2000 a year to the rates, it was a little hard that a competitive undertaking should run down the gas, implying that it was unwholesome and unhealthy, when all the while the electric light undertaking was taking over £1700 a year out of the ratepayers' pockets. He protested against the implication that the article supplied by the Gas Company was unwholesome. They had in contemplation the laying of a high-pressure main in the principal street, in order to supply the latest burners, which were giving such complete satisfaction. They had entered into a new contract with the town for lighting the public lamps for a period of two years. The cost was slightly reduced, owing entirely to the fact that in their general arrangements they were able to make a little saving which they were pleased to give to the town. With the high-pressure burners which they had installed in two undertakings in the town, they were able to register 60-candle power for every foot of gas used. This meant that over 1000-candle power per hour could be given for 1d. The firms had adopted this method of lighting both from economic reasons and from the lighting point of view; and in both cases gas had superseded the electric light. The report and balance-sheet were adopted; and dividends at the rate of 13 per cent. per annum on the "A" stock, 10½ per cent. on the "B" stock, and 10 per cent. on the "C" stock were declared. Votes of thanks were accorded to the Chairman and the Secretary and Engineer (Mr. J. T. Jolliffe) and staff.

Steady Progress Makes a Record Year at Tonbridge.

At the ordinary general meeting of the Tonbridge Gas Company on Monday last week, the report presented by the Directors, which was read by the Secretary and Engineer (Mr. James Donaldson), showed a profit of £4225, and a sum of £6445 available for distribution; and the Directors recommended dividends of 12½ per cent. per annum on the "A" stock, 9½ per cent. per annum on the "B," "D," and "E" stocks, and 5 per cent. per annum on the "C" stock. The Directors stated that the consumption of gas showed a satisfactory increase of 5 million cubic feet, or 5¼ per cent. They were pleased to inform the shareholders that they had decided to reduce the price of gas by 1d. per 100 cubic feet from the 31st inst.; and they said that if a favourable contract for coal was concluded, they hoped to make a further reduction of a similar amount from the 30th of June. This will bring the price of gas to 2s. 6d. per 1000 cubic feet. They added that the year's working had been highly satisfactory. The extension of the main to Leigh was completed, and the results obtained had more than realized the most sanguine expectations of the Directors—about 60 new consumers having been connected. The Chairman (Mr. W. Judd), in moving the adoption of the report, expressed the deep regret of the Directors that Mr. Fagg had found it necessary, owing to failing eyesight, to resign the chairmanship; but they hoped they might still have the benefit of his valuable experience for a long time to come. He had been a Director for 43 years; and they were all glad he was still able to occupy this position. Turning to the working, the Chairman said that if the past year had not been one of great extension, it had been one of steady, continuous progress, and was a record in the history of the Company, owing to the fact that for the first time the manufacture of gas had exceeded 100 million cubic feet. This increase was most satisfactory, considering the fact that, owing to the great depression in trade and the mild weather, so many other companies had to report a decrease. Progress was still maintained; the increase from the beginning of the year being 1½ million cubic feet. The number of slot meters in the district was now upwards of 1800, from which a total of £3300 was collected last year, or more than 25 per cent. of the whole of the income for gas. Considering the size of the town and the distance from the coalfields, he thought the price of gas in Tonbridge would compare favourably with any other town in the country. The motion was carried unanimously, and the dividends recommended were declared. On the motion for the re-election of the retiring Directors, the Chairman read a resolution of which notice had been given to increase the number to nine. On being put to the meeting, however, it was lost by 19 votes to 9, and on a poll by 379 votes to 286. Thanks were accorded to the Chairman, Directors, Secretary and Engineer, his Assistant, and the staff; and the proceedings closed.

Water.

Additional Water-Works for South Staffordshire.

In the report presented at the half-yearly meeting of the South Staffordshire Water Company last Thursday, the Directors stated that the gross amount of water-rates for the six months ending the 31st of December last was £72,955, compared with £72,446 in the corresponding period of 1907. They had transferred £2000 to the

depreciation fund, raising it to £29,710. After providing interest on debenture and preference stock, the amount remaining for distribution was £30,433; and the payment of a dividend for the half year at the rate of 7 per cent. per annum (less income-tax) was recommended, leaving £7806 to the credit of the next half year. The Engineer (Mr. H. Ashton Hill) reported that the whole of the machinery, buildings, and plant were in substantial order and repair. In moving the adoption of the report, the Chairman (Mr. C. G. Beale) said the expenditure on capital account during the half year had been £9368, which was not a large amount in relation to the increase in the total value of the works. The revenue account was not altogether satisfactory, in the sense that the income had not increased at anything like the normal rate. The domestic supply kept up fairly well, because as they added extra houses they brought in revenue immediately afterwards. The trade supply, however, was a very variable quantity. The domestic supply had increased by £1163, and the public purposes supply by £41. The latter was a disappointing figure. Previously they had flattered themselves that the decrease in the public supply was largely due to an abnormally wet season, which had led to less water being used on the roads. This could not be urged in respect of the second half of 1908. It showed that the improved methods of making roads had led to less water being used upon them than was formerly the case. There had been an increase of £71 in building supplies, which was an indication in the right direction; and this brought the total increase up to £1275. He was very sorry to say, however, that the decrease of £765 on trade supplies had reduced the net increase to £510. In reference to the expenditure, the charges in respect of engines had gone up by £468, which was largely accounted for by the fact that they had pumped 46 million gallons more water than in the corresponding half of the year 1907. The expenditure in regard to rates had increased by £247. He wished he could say they were getting near the top figure in this respect; but he could not. The amount water companies paid under this head was about 10 per cent. of their gross receipts—an enormous proportion. On a collection of £75,000, the bad debts amounted to only £32, which was the lowest sum reached in the history of the Company, and one which they would hardly be able to reduce. Referring to the Bill the Company are promoting for power to construct new works, and for the confirmation of existing ones, the Chairman explained that the Company had been compelled to seek these powers in consequence of a decision of the Court of Appeal in which it had been held that the South Staffordshire and five or six other Water Companies had been taking a wrong view of certain sections of early Acts of Parliament in regard to the authorizing of the sinking of new wells on land purchased by agreement. They, in perfect good faith, had been acting on the view of the law which they considered the correct one, but which they now found to be incorrect. They were applying for authority for works for which at the present time they had no parliamentary sanction. This had led to a great deal of commotion on the part of local authorities in the district; and they would have to face very widespread opposition. He hoped they would be able, in the course of the next few weeks, to meet many of those who were opposing them, and to agree to what was reasonable in the way of protection in respect of the works they were asking to have authorized. They must, however, resist strongly the claims made by the few authorities he had referred to. The shareholders could rely upon it that the Directors would approach the authorities concerned in a reasonable and conciliatory spirit. He was perfectly sure they would obtain the powers they were seeking to carry out the new works, and the sanction for which they were applying in respect of those now existing. Mr. Frank James seconded the motion; and it was carried.

MANCHESTER CORPORATION GAS DEPARTMENT.

Twenty-Five Years' Progress under Mr. Nickson's Superintendence.

Mr. Charles Nickson, the Superintendent of the Gas Department of the Manchester Corporation, celebrated his eightieth birthday on Saturday, and was the recipient of many hearty congratulations. For a quarter-of-a-century, Mr. Nickson has been head of his department; and Mr. H. J. Brocklebank, the Statistician to the Gas Committee, has prepared a return, showing how the undertaking has developed during this period. We take from it the following particulars.

Since 1883, the amount paid towards the reduction of rates from the profits of the Gas Department has been £1,387,097; and taking all the years from 1844, when the works were acquired by the Corporation, the money so handed over totals £2,858,585. In the period under notice, the capital employed has increased, in round figures, from £1,250,000 to £2,750,000; but the capital charge per million cubic feet of gas is materially less—viz., £496, against £540. The loan debt has grown from £727,809 to £1,216,040; but the charge per million cubic feet of gas sold has been brought down from £309 to £223, or 27·8 per cent.

The prosperity of the undertaking, Mr. Brocklebank points out, is illustrated by the fact that, in spite of the additional burdens which the department has been called upon to bear, the percentage of expenditure against income has increased by the nominal figure of only 2·95 per cent. To-day the producing capacity of the works is nearly 27 million cubic feet per 24 hours, against 13 millions 25 years ago. The storage capacity, when the new holder at the Bradford Road station is completed, will be 34½ millions, compared with 14 millions.

Following upon the Gas Committee's decision to supply gas-stoves free to consumers, the "day load" of the works has been enormously increased; for while the total consumption has gone up by 124·6 per cent., the daytime consumption has grown to the extent of 227·5 per cent. According to the report, gas-stoves and automatic meters consume about 20 per cent. of the total output of gas. The cumulative value of the concessions to consumers is put at £1,214,234 for reductions in the price of gas; £271,331 for the abolition of meter and stove rents; and £264,090 for reductions due to the incorporation of outtownships.

PUBLIC LIGHTING OF RUGBY.

Gas or Electricity.

As briefly recorded in last week's "JOURNAL," the Rugby Urban District Council, at a recent meeting, had before them the consideration of a proposal to convert the street lighting from gas to electricity. The matter had been introduced by Mr. Wilson at a previous meeting, and adjourned. When the question came up for the second time, Mr. Wise moved, and Mr. Styles seconded, that the scheme be referred to a Special Committee for consideration and report.

Mr. C. Meiklejohn said he would like to deal with Mr. Wilson's proposal from three points—first, that it arose from pure bluff; secondly, that it was based on pure greed; and, thirdly, that it was devised and projected from pure ignorance. With regard to the first, Mr. Wilson was making a mistake, because there was nothing to bluff about. The conditions under which the Gas Company supplied the town were such that the Council had had the benefit of every reduction in price that had taken place; and as the sliding-scale had always been in operation, the question did not arise that any amount of bluff could have the slightest effect on the price. As to the second point, he said he found that the fuel costs in the best regulated works were 1-5d. per unit generated; so that it appeared to him that under the present contract with the Council, the Electricity Supply Company must of necessity be securing at the present moment, if the Council were sending out 180,000 units per annum, at least £1500 net profit, and the effect of the adoption of Mr. Wilson's scheme would be an additional profit to the Company of from £800 to £1000 per annum. This being so, how could Mr. Wilson dissociate himself from the suggestion that his proposal was for the purpose of benefiting his own Company, and not from any consideration for the town? As to his third point, he said he did not mean it in a personal sense; but simply that Mr. Wilson had not sufficient knowledge of the matter. Mr. Wilson made reference to the fact that other towns had adopted electricity; and he quoted the Marylebone Borough Council. It was true that Council had adopted the system; but the conditions under which they did so should be the greatest possible warning to similar bodies on the questions of extravagance and ill-considered capital expenditure. If Mr. Wilson had known what he (the speaker) knew, he would not have gone within 500,000 miles of Marylebone. They bought the undertaking for £1,397,181; and it was the most tragic exhibition of incompetent finance that the country could produce. They decided to acquire the undertaking before they had authority financially to do so; and after making an agreement with the supplying Company, they were unable to raise the money. They then had to go to Parliament for an Act, and in the interim the Company carried on the Council's work. During that time, the sum paid to a Consulting Engineer for commission was £3115. The total capital expenditure of the Council was £2,008,108; and the Consulting Engineer received £21,746. If this was an example of the sort of counsel Rugby was to be asked to follow, he left them to judge whether it was not a serious matter. He hoped that nothing he said would give the impression that he was biassed. He was as deeply interested in the success of any department of the Council as Mr. Wilson, and had quite as much at stake in Rugby. The point he wanted to make was this—that if they burdened any concern with capital to such an extent that they could not meet their expenditure out of revenue, the only result would be—as it was at Marylebone—that they multiplied their public lighting, not because they wanted more light, but for the sake of making the department pay. They could not force the revenue of the district; but they could force public lighting. In regard to the Gas Company's terrible charges, Mr. Wilson said the Council paid the Gas Company last year £1680; but he (Mr. Meiklejohn) said the total sum paid for maintenance was only £1493—the £1680 including £40 for tar, a balance brought forward from the previous year, &c. Mr. Wilson referred to the fact that certain lamps were only lighted during the winter. There were four months when some were not lighted; but he (Mr. Meiklejohn) had offered to complete the lighting for the whole year for an additional £75. In his election address, he stated that he was barred by law from voting on such a question as public lighting; but he did not stand in any different relation to public lighting in Rugby than did Mr. Wilson, beyond the fact that he was a shareholder of the Gas Company. Mr. Wilson was the servant of the contracting Electricity Company; and if he (the speaker) transferred his shares, he should be as well qualified as Mr. Wilson to vote on this matter. But, as a matter of fact, if he transferred his shares, he would not, as a matter of decency, vote on any question where his Company were concerned. The question of the comparative merits of the two systems was one which he left to the Committee that was to be appointed; but he confessed that, considering the enormous amount of capital that was suggested to be spent for the comparatively poor return, his own feeling was that the only Committee to which it should be referred was the Cemetery Committee, and the sooner they disposed of it the better. If the Council decided to erect their own generating station, and it could be shown that electricity would be cheaper than gas, he would vote for it—if Mr. Wilson would agree to oppose it should gas be proved to be the cheaper for the town.

After several other members had joined in the discussion, the matter was referred to a Committee consisting of the Chairman (Mr. W. H. Linnell), Messrs. Wilson and Meiklejohn, one representative of the Finance Committee, one from the Highways Committee, and two from the Electric Lighting Committee.

West Ham Corporation and the Gas-Works.—At the meeting of the West Ham Town Council last Tuesday, the Legal and General Committee reported that, as desired by the Council, they had considered the advisability of purchasing the West Ham Gas Company's undertaking. They had not, however, before them sufficient information on several points to enable them to come to a decision, and had therefore adjourned further consideration of the matter to give the Town Clerk an opportunity of getting particulars that would enable them to go into the question in greater detail.

ELECTRICITY SUPPLY LOSSES AT REIGATE.

Charges to be Increased.

At the Meeting of the Reigate Town Council on Monday last week, the financial position of the borough electric light undertaking was the subject of an interesting discussion. The Electric Lighting Committee, at their meeting on the 16th ult., resolved—"That the fifth resolution of the Electric Lighting Committee at its meeting on the 23rd day of April, 1900, fixing the rate for the maximum-demand system at 7d. and 4d. the unit, and the fifth resolution of the 13th day of September, 1906, fixing the flat-rate system at 5½d. the unit, be respectively rescinded, and that instead thereof, on and after the 31st day of March next, the maximum demand be 7½d. and 4½d. the unit, and for the flat-rate system 6d. the unit;" "that, on and after the 31st day of March next, no discount be allowed for current supplied;" and "that, on and after the 31st day of March next, consumers be charged meter-rents—viz., 2s. per quarter each meter up to 18 amperes, and from 18 amperes upwards 2s. 6d. per quarter each meter."

Dr. Colman, the Chairman of the Committee, speaking upon the recommendations of the Committee, said this matter arose very much out of the result of the inquiry held when they attempted to borrow £4000 a short time ago (see *ante*, p. 261). The Committee gave the matter their very careful consideration, and they felt that the time had arrived when the general body of ratepayers ought to be relieved of the burden of paying a rate every year towards maintaining these electricity works, and allowing the consumers to have the electric light at a lower price than it cost to produce. The works were now in a normal condition as to supply and demand; and as they were to-day they would probably be for some time to come—faced with a yearly deficit. The proposals he was placing before them were somewhat drastic, and required a good deal of explanation. In the first place, they had to consider the public; in the second, they had to bear in mind the extraordinary difference that had been made in the consumers' accounts owing to the introduction of the metallic filament lamp. He had figures before him which would clearly show how this had affected their revenue. In Dublin, the Electrical Committee were asking for an increase of ¾d. per unit owing to the existence of this lamp; and in Hastings they lost £3000 last year, following a profit of £187, owing to it. In Hampstead, they lost £2000 in one quarter; and in Walsall they had had the highest deficit they had ever known. Reigate was a very difficult borough to work, as the cables had to be taken a long way to earn very little money; and they had to use the alternating current, which was less economical than the continuous current. They expected that the ½d. per unit increase in the charge would produce something like £655, and the abolition of the discount would raise their revenue by about £120; while by charging for the meters they hoped to add to their income by about £210. These three items would increase the revenue account by £885. On the other side, they expected to lose about £275 on account of the use of metallic filament lamps. If they got the loan they had applied for, they would immediately have a sum of £2500 to repay from the district fund; and this would entail an additional expenditure, also from revenue, of about £175. Then they came to the third item—the estimated deficit, which they reckoned would be something like £350 on this year's trading. These three sums together made a total loss of £800, against which they proposed to raise an additional £885, and by so doing hoped to arrive at a condition of equilibrium and a saving of the rates. The Council must realize that they could not expect the public any longer to continue to pay a rate to allow the few consumers—to many of whom it was a matter of luxury—to have electric light at a price less than it cost to produce.

Mr. Ince, criticizing the remarks of Dr. Colman, expressed the belief that the difficulties the Committee had to contend with would be greatly increased by the methods they proposed to adopt. The Chairman's estimate of the loss through the introduction of the metallic filament lamp was based upon three months' experience; and he (Mr. Ince) ventured to suggest that this was not long enough, and that the method which the retail tradesmen had adopted, of having more light in their shops, would be followed by the private consumers. Every business man knew that immediately the price of commodities was increased consumption went down. If the Committee had adopted the heroic policy of bringing down the price of electric energy, making it available for all the ratepayers, undertaken to equip their houses, and charged so much per annum through the slot system, the halcyon days of the undertaking which had been looked forward to might reasonably be expected. He submitted that the proposals of the Committee were breaking faith with the consumers, and there were numbers in the borough who had spent large sums of money in equipping their premises, not exactly on an undertaking by the Corporation, but on the reasonable expectation that the prices would not be increased. To break faith with 450 consumers was a wrong policy; and it was not a consistent one. The speaker went at some length into the finances, and concluded by moving, as an amendment, that the resolutions be referred back to the Committee for further consideration.

After some discussion, Dr. Colman replied to the criticisms of Mr. Ince. He said he did not agree with him that the Committee's proposals were irritating and annoying. They constituted a business-like proposition which he hoped would meet with a proper reward. Four years ago they sold 163,000 units, and their labour bill was £2 more than it was to-day when they were selling 273,000 units. He was quite certain they could not reduce the expenditure on the works.

On the amendment being put, it was supported by only two members; and the recommendations were thereupon agreed to.

Dangers of Raw River Water.—The substitution of Ohio River water for a ground-water supply at Bellevue (Pa.) for a few days about the middle of last January caused ill-health among some 4000 people out of a population of 32,000. The untreated river water was furnished from the 15th to the 17th of the month, and was supplied by the Ohio Valley Water Company, whose ordinary supply from driven wells on Neville Island, about four miles below Pittsburg, ran short.

METROPOLITAN WATER BOARD.

Rebate on Charges—Water Supply in January.

At the Meeting of the Metropolitan Water Board last Friday, the Appeal and Assessment Committee presented a report dealing with the Government and municipal buildings rebate under the Board's Charges Act of 1907. At the previous meeting of the Board, consideration of the report was adjourned on the request of Lord Welby, the Chairman of the Finance Committee. The Committee now reported that the proposal was to grant a rebate in certain cases in which it could not legally be demanded by the Government or other public authority concerned; and they had no hesitation in expressing a strong opinion that, in view of the position foreshadowed by the estimates recently submitted to the Board, the present moment was entirely inopportune for the grant of any such concession. They had, therefore, requested their Chairman to oppose the recommendation of the Appeal and Assessment Committee, which was in the following terms: "That, provided the other conditions of section 9 of the Metropolitan Water Board (Charges) Act, 1907, are complied with, the rebate therein mentioned be not withheld from a house or building occupied for the purposes of a trade or business, merely on the ground that the occupier does not seek a livelihood or profit from such trade or business." Mr. Musgrave, the Chairman of the Committee, proposed that, as the question was of domestic and not of public interest, it should be considered in private; and this was agreed to. On the representatives of the Press being readmitted, it was stated that the recommendation had been adopted.

A return was presented relating to the supply of water for the month of January. It showed that the average daily quantity sent out was 222,547,000 gallons. The number of houses, &c., supplied was 1,086,688; the estimated population being 7,036,649. The mean supply per head per day was 31·6 gallons, compared with 32·3 gallons in the corresponding month of 1908. The total quantity of water in store in impounding reservoirs at the end of the month was 7467 million gallons, against 6698 millions at the end of January, 1908.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The visit of the Western Juniors to the Paisley Corporation Gas-Works this afternoon was, as the President expressed it, one of the most instructive visits they had had. There are novelties in the gas-works at Paisley which are seldom seen elsewhere. Mr. Hislop does not do anything simply because somebody else does it. Hence his variation from methods which are universal in practice, and hence also the value, to inquiring minds, of a visit to these works, where, at a glance, it is to be seen that there are other methods of arriving at the same result—and that sometimes the other method obtains a better result. It was freely acknowledged by members of the Association that in the two hours spent in the Paisley Gas-Works a liberal education had been acquired.

The Corporation of Glasgow—the first in Scotland to actively promote trade in gas for heating and cooking—is also the first to call a halt in the movement. At the meeting of the Town Council on Thursday, the minutes of the Gas Committee contained a recommendation that premises in Sauchiehall Street should be leased for ten years, at a rental of £550, as a show-room for gas appliances. At present the Corporation have a show-room in Union Street, the lease of which expires in May. Mr. J. H. Mathieson, a member of the Electricity Committee, moved disapproval of the recommendation. The annual cost of the Stove Department, he said, was £14,209; the rent of the shop, £561; the cost of fittings, £118; and of gas, £236—a total of £15,124. Interest on capital amounted to £2004; sinking fund required £1219; and depreciation, £6628—making a total annual charge of £24,975. The annual receipts amounted to £7528; showing a deficit on the department of £17,447, or ¾d. on the rates. Mr. J. Willock, a member of the Gas Committee, supported the recommendation. Bailie Russell believed that if the matter were investigated it would be found that the loss on the department, from first to last, had been something like £60,000. Treasurer Graham, a member of the Electricity Committee, was of opinion that the Corporation had already done their duty in the matter of bringing gas-stoves before the community. He disapproved of the taking of a shop for ten years, and suggested that they should continue in their present shop for another year, at the end of which time the whole policy could be discussed. Bailie Dunlop thought that the Corporation had already demonstrated the usefulness of gas-stoves, and that there was no use in continuing the department at such an enormous loss. Bailie Paxton, the Sub-Convener of the Gas Committee, hoped that the Council would not cripple the enterprise of the Committee. Mr. R. Kirkland, a member of the Committee, disputed the notion that the Corporation had completed their educational work in the matter of gas-stoves. In 1902 there were 21,000 of these stoves on hire. During the three following years the number was 25,000; and between the years 1905 and 1908 it had risen to 50,000. The public were only beginning to realize the value of gas-stoves. If they had another ten years of propaganda, he was confident that they would be able to reduce the price of gas by 4d. or 2d. Bailie M. W. Montgomery, the Convener of the Gas Committee, considered that the statement of Mr. Mathieson that there had been a loss of £17,000 on the Stove Department was extravagant. This sum represented the annual charge on the department, not the loss. Replying to Lord Provost M'Innes Shaw, Bailie Montgomery said that, basing his figure upon the experience of other gas concerns, their estimated revenue from gas-stoves was between £50,000 and £60,000. Only 20 per cent. of the users of gas in Glasgow had gas-stoves, as compared with 41 per cent. in Manchester. With regard to what Mr. Mathieson had called a loss of £17,000, this was due to a great deal being charged which ought not to have been charged by a fair way of accounting. The £17,000 was more or less of a book entry, and did not represent by any means the actual expense to the gas-stove account. The

department was economically managed. A vote was taken by the calling of the roll, when 24 voted for the recommendation of the Committee, and 33 against. The result of the vote is that at Whitsunday next the Corporation of Glasgow will cease, as a Corporation, to lay before the community the advantages of using gas for heating and cooking. Of course, the Stove Department will go on, but under other conditions, which it will fall to Bailie Montgomery and his Committee to devise.

The Edinburgh and Leith Gas Commissioners held a monthly meeting on Monday—Provost Smith, of Leith, presiding. The report of the Engineer showed a decrease in the output of gas for January, as compared with the corresponding month of last year, of 4 million cubic feet; and a decrease, since May 16, of 62½ millions—equal to 4·25 per cent. The Works Committee announced that at their meeting on Feb. 15 the Engineer had reported that a 12-inch gas-main in Chambers Street, Edinburgh, had recently been fused by the electric light installation belonging to the Corporation. The Commissioners adopted the report. It was agreed to borrow about £80,000 on mortgage, at 3¼ per cent. interest.

An action has been brought before Lord Guthrie in the Court of Session, at the instance of George Graham, a locomotive driver, residing at 18, Milton Street, Edinburgh, against Miss Jane M'Allum, baker, of 65, South Bridge, Edinburgh. Pursuer's son, Henry L. Graham, 20 years of age, received fatal injuries in an explosion of gas in the defender's bakehouse, in which he was an employee, early on the morning of Nov. 30 last. The pursuer sues for £500 as damages. The fault averred is that the gas-jet by means of which the interior of the oven was lighted was inside the oven. It has now, he says, been fitted outside, so that it can be made to light the interior. In defence, it is said that the accident was due to the deceased having failed in his duty to pull out the damper so as to clear the oven of any gas there might be in it, before striking a light. Because of this contributory negligence, it is pleaded, there is no liability on the defender.

The state of antagonism—feud would probably be too strong an expression—which exists between the Lanark Gas Consumers' Company, Limited, and the Town Council, took a new form at the last meeting of the Council. The Gas Company are now erecting a new gasholder, and they wrote to the Council asking for a supply of water—about 580,000 gallons—for the filling of the tank. The Water Committee carefully considered the application, and recommended the Council to allow the Company to enlarge their connection to the main to a 3-inch one, to place a meter upon it, and to pay at the rate of 8d. per 1000 gallons, provided that the supply were taken in such quantities and at such times as directed by the Water Committee, and on the further condition that the Company lay a gas-pipe in Bonnington Avenue for public lighting These conditions were unanimously agreed to by the Council. The Clerk then read a letter from the Secretary to the Gas Company, intimating that his Directors failed to see any connection between the application for water and the laying of a gas-pipe in Bonnington Avenue, and that they could not agree to that condition; also pointing out that the Council were not giving the water at a reduced rate by stipulating for the putting on of a 3-inch water-meter, which would be an expense to the Company of something like £20. The Council were asked to again consider the matter. This letter was sent to the Water Committee to dispose of, with powers.

While the nightly entertainment was in progress in the Alhambra Music Hall in Aberdeen, on Monday evening of this week, the electric light in the building suddenly went out, leaving the place in darkness. There was no panic at the sudden extinction. The light was restored in about ten minutes from the time it went out.

An explosion of gas of considerable severity occurred in a provision shop occupied by Miss A. Massie, at the corner of Bath Street and Castle Street, in Fraserburgh, about nine o'clock on the evening of Saturday last. The shop windows facing both streets were blown out, and some of the goods in them thrown to a distance of nearly 50 feet. The ceiling of the shop was greatly damaged, as were also the goods in the shop; and a partition wall was demolished. Miss Massie and another lady were the only occupants of the place at the time. They both sustained considerable injury from burning, and suffered from shock. There had been numerous complaints during the day of a smell of gas in the vicinity of the shop, which became worse in the evening; and the explosion was brought about by Miss Massie striking a match with a view to searching for the cause of the escape.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Feb.* 27.

Demand has been fairly well sustained, but available supplies have been sufficient to meet it, and there has been no further improvement in values. The closing quotations are, therefore, £11 7s. 6d. per ton f.o.b. Hull, £11 10s. per ton f.o.b. Liverpool, and £11 12s. 6d. per ton f.o.b. Leith. Agricultural operations being in a forward condition, home demand has been good, and has helped to sustain the market. There continues to be considerable inquiry from abroad for delivery ahead; but prices do not tempt producers, and any business done has been taken speculatively at about the level of spot values.

Nitrate of Soda.

A large business has been done in cargoes in various positions at advanced prices, but the spot quotations remain 9s. 9d. and 10s. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *March* 1.

Business in tar products is still very quiet, and prices are on the whole without alteration. Benzol, 90 per cent., is in a very bad state, and there are large quantities offering at almost every available port. Fifty-ninety per cent. benzol is very weak; and in the North several parcels can be purchased at 6½d., casks included, f.o.b. Toluol remains

steady, but without any fresh business. Creosote is fetching very good prices. In London, makers are asking 2⅞d. to 3d.; in the Midlands, 2⅞d. to 2⅞d.; and in the North, 2⅞d. to 2¾d. There is practically nothing doing in crude carbolic. In pitch, the market does not seem to move either one way or the other; and the majority of manufacturers, being well sold to June, are in a position to ask more than the ruling prices for any little inquiry which comes into the market for this period. For July onwards, the makers' ideas of prices are also higher than the consumers', and in consequence very little business is being done.

The average values during the week were: Tar, 10s. 9d. to 14s. 9d., *ex* works. Pitch, London, 18s. 6d. to 18s. 9d.; east coast, 18s. 3d. to 18s. 9d.; west coast, 17s. to 18s. f.a.s. Mersey ports, 17s. 6d. to 17s. 9d. f.o.b. other ports. Benzol, 90 per cent., casks included, North, 5½d. to 5⅝d.; London, 6d.; 50-90 per cent., casks included, North, 6½d. to 6¾d.; London, 7d. Toluol, casks included, North, 8¾d. to 9d.; London, 9d. to 9¼d. Crude naphtha, in bulk, North, 3d. to 3¼d.; London, 3¼d. to 3⅜d.; solvent naphtha, casks included, North, 10¾d. to 10⅞d.; London, 11⅛d. to 11⅛d.; heavy naphtha, casks included, North, 10d. to 10⅛d.; London, 11d. to 11⅛d. Creosote, in bulk, London, 2⅜d. to 2⅝d.; North, 2⅜d. to 2⅜d. Heavy oils, in bulk, 3d. Carbolic acid, 60 per cent., casks included, east coast, 1s.; west coast, 11¼d. Naphthalene, £4 10s. to £7 10s.; salts, 35s. to 37s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been nothing exciting to close the month. Quotations to-day are: In Hull, £11 7s. 6d. to £11 8s. 9d.; in Liverpool, £11 10s.; and in Leith, £11 12s. 6d. There has been a little inquiry for delivery over the near month; but makers are indifferent about making sales, and buyers will not pay anything more than prompt prices. Consequently, business is very limited.

COAL TRADE REPORTS.

Northern Coal Trade.

There is a steadier demand in the coal trade; and the shipments are now fully an average for this season of the year. In the steam coal trade, the approach of the spring shipments seems to be steadying the prices; and for best Northumbrians from about 9s. 9d. to 10s. per ton f.o.b. is quoted for prompt shipment, with a higher forward price. For second-class steams, 9s. to 9s. 6d. is the current value; and steam smalls are not quite so plentiful, and are firmer at from 4s. to 5s. 6d., according to quality. In the gas coal trade, the exports are good, and the home demand is full. Durham gas coals are quoted from 8s. 9d. to 10s. per ton f.o.b. for the usual kinds, according to class, and up to 10s. 6d. for "Wear" specials. More of the long contracts have been settled—for London, at a price expected to leave from 8s. 5d. to 9s. 3d. per ton f.o.b., according to the class; and it is evident that a considerable part of the contracts have been arranged. A few sales of gas coals have been made for export, at somewhat similar prices; and the collieries, having booked a fair number of orders, appear firmer in their quotations. In the coke market, prices seem quieter; and gas coke is still rather plentiful, at from 10s. 9d. to 11s. 3d. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

Trade shows no sign of improvement. Shipping orders are very scarce, and, as a consequence, supplies are plentiful. The Conciliation Board last week, through their Referee (Lord Ardwall), decided that the wages of the miners are to be reduced, as from March 1, by 6¼ per cent.—equal to 3d. per day, making the nominal daily wage 6s. The prices quoted are: Ell 9s. to 9s. 9d., splint 9s. 9d. to 10s., and steam, 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 210,780 tons—a decrease of 45,072 tons upon the preceding week, and of 35,688 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,607,277 tons—an increase of 63,414 tons upon the corresponding period.

Additional Capital for the Tottenham and Edmonton Gas Company.—It will be seen from an announcement which appears elsewhere that the Tottenham and Edmonton Gas Company are inviting tenders for a further issue of £30,000 of "B" consolidated stock; being a portion of the additional capital authorized by their Act of 1906. The standard rate of dividend on this stock is 3½ per cent. per annum; but last year it carried, under the sliding-scale, 5¼ per cent., and the present charge for gas will permit of the payment of £5 7s. 6d. per cent. The minimum price of issue is £108 per £100 of stock; and tenders are to be delivered not later than the 15th inst.

Sales of Stock and Shares.—At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards placed, by order of the Directors, a new issue of 5 per cent. £10 preference shares in the South-West Suburban Water Company at from £12 2s. 6d. to £12 10s. each, *cum div.* from the 1st prox. Other new issues were for the Directors of the Herts and Essex Water-Works Company, Limited, and consisted of some 4 per cent. mortgage debentures and 500 ordinary £10 shares. The former were sold at par, and the latter at £8 10s. to £8 12s. 6d. each. On the same occasion they sold a few £10 "G" shares (7 per cent.) in the Aldershot Gas and Water Company at £14 10s. to £15 each; and some 5 per cent. "G" preference shares, of the same nominal value, at £12 to £12 2s. 6d. apiece. A successful sale of Eton gas shares was held by Mr. Howard Hetherington, at Eton, last Wednesday. After a spirited bidding, the "A" £15 shares were knocked down at £31 5s. each; the "B" £15 shares, at £19 15s. each; and the "A" £15 shares on which only £5 had been paid, at £8 10s. apiece.

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Gas-Works Extensions at Kirkby-in-Ashfield.

An inquiry on behalf of the Local Government Board was held by Major J. Stewart, at Kirkby-in-Ashfield, last week, relative to an application by the Urban District Council for permission to borrow £6000 for the extension of the gas-works and mains. The Clerk (Mr. E. B. Hibbert) said the district included 3750 houses, of which only 2185 at present took gas. The chief object of the loan required was to extend the supply. He explained that up to a few years ago Kirkby did not have its own gas-works, but was supplied by Sutton-in-Ashfield. The Inspector asked how it was that the Council charged lower prices for gas than had to be paid when Sutton controlled the supply. Mr. F. Abbott, the Chairman, explained that formerly there were very few customers, owing to the high price; and the Council reduced the charge, in order to induce people to take gas. This policy had proved successful. The Gas Manager (Mr. S. Shadbolt) stated that the retort-house was not large enough for the increased demand; and about twelve months ago it had had to be extended. The Inspector remarked that he was satisfied that the Council did not spend any more money than was necessary for the effectual working of the undertaking. It is intended to lay mains in all streets where houses are erected.

Co-Partnership in the Tunbridge Wells Gas Company.

An interesting gathering took place at the works and offices of the Tunbridge Wells Gas Company on the 20th ult., when the Chairman (Alderman W. H. Delves, J.P.) and a Committee of Directors, with the officers, took the opportunity of meeting the employees, numbering upwards of 130, and presenting each man with his pass-book, with bonus and any personal savings duly credited for the past six months, since the co-partnership scheme was adopted. The Chairman addressed the men on the importance of the scheme, the main objects of which were, he said, "to sell gas at the lowest possible price; to induce employees to take a real interest in their work by the saving of material and wages; assisting towards increasing the business and to enable employees to become stockholders in the Company." Messrs. R. Pelton, J.P., and R. Howard (Directors) also addressed the meeting; the former making reference to Alderman Delves' connection with the Company as a Director for the past 50 years—21 years as Chairman. The books of the co-partnership scheme have been audited, and show that several of the co-partners have taken advantage of the scheme by adding to their bonus, and have acquired a small holding of the Company's stock. On the proposition of the workmen's representative on the Committee of Management, a hearty vote of thanks was accorded to the Chairman, Directors, and officers, for the very great interest they had shown in introducing the scheme, and the clerical work necessarily entailed.

The Directors of the Shanghai Water Company recommend, subject to audit, a final dividend of 30s. per share.

South Staffordshire Mond Gas Company.

Presiding at the eighth ordinary meeting of the South Staffordshire Mond Gas (Power and Heating) Company, at Dudley Port, Mr. G. Macpherson said he thought that the result of the past year's working was eminently satisfactory. In whatever way the figures were regarded, there was substantial improvement. The quantity of gas sold at dump prices last year was 37 per cent. less than in 1907, and that sold to ordinary customers 60 per cent. more; and the average price realized for all the gas sold was 40 per cent. more in 1908 than in the previous year. Last month the quantity sold at dump prices was 10 per cent. only. The number of their customers was increasing at a satisfactory rate. He had hoped to have been able to have announced that at the end of January last they had made a profit; but during the first week nearly every works they supplied was either entirely or partly closed. They did not make a profit; but the loss was less than in any previous month, and they were within sight of the time when the loss on revenue account would cease. During the year arrangements were concluded with the Wednesbury Corporation, under which that authority generated all the electric current required in the borough by means of engines driven with gas from the Company's works. So far as they were aware, the supply to the Corporation was satisfactory; and the success of the installation would, it was hoped, give confidence to neighbouring authorities. The Board were engaged in negotiations which would involve the extension of the mains, and which would materially increase the consumption of gas. Mr. Alfred Mond, M.P., seconding the adoption of the report, remarked that they were only in the infancy of this great enterprise. It was a matter for satisfaction that there was no figure laid before the House of Commons when the Act was obtained that had not been verified by practical working, and no statement made that could not be proved. The fact that they had 84 customers, and more in prospect, provided ample evidence that the claims made by the promoters respecting the advantages of Mond gas in economy of fuel, cleanliness, and regularity of output, had been fully established. Now that a crucial point in the career of the Company had been reached, he believed they would make much greater progress than in the past. The report was adopted.

Extension of Co-Partnership and Profit-Sharing.—Last Thursday, Mr. W. H. Lever, M.P., head of the firm of Lever Brothers, Limited, laid before a large gathering of the employees a comprehensive scheme of co-partnership, in which about 1150 will participate. Partnership certificates to the value of £500,000 are to be created. The following day, Sir Alfred Newton, who presided at the meeting of Harrod's Stores, Limited, asked, on behalf of the Directors, that the shareholders should vote them £12,600 from the year's profits, to be used for the benefit of the employees. He said it was proposed to allocate £5000 to the pension fund and £1000 to the provident association; while the rest would be used to celebrate the jubilee of the firm by giving every member of the staff a full week's wages extra. The money was voted.

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Cheaper Gas at Cradley Heath.

The report submitted at the annual meeting of the Cradley Heath Gas Company showed that during the year there had been a slight decrease in the sales of gas, which was accounted for by the depressed state of trade and the exceptionally mild weather during the latter half. The profit amounted to £3383; and the Directors recommended that dividends of 10 per cent. on the original shares, 7 per cent. on the ordinary shares, and 4 per cent. on the preference shares be declared. The report was adopted; and it was stated that the Board had made a reduction of 2d. per 1000 cubic feet in the price of gas.

The Company-Promoting Frauds.—At the Mansion House Police Court, on Wednesday, Walter Darby was again brought up, and charged with conspiring with two others, named Gyde and Marcus (both in prison), to defraud in connection with the North Wales Slate Quarries, Limited, and the Welsh Slate Quarries, Limited. Additional evidence was given, and the case was then again adjourned—bail being refused. The accused was brought up again on Friday, and underwent a final examination, at the close of which he was committed for trial at the Central Criminal Court.

Economies in Lighting and Pumping at Maldon.—At a recent meeting of the Maldon Town Council, particulars were given as to the cost of public lighting by gas with automatic controllers and improved burners. In 1906, the cost for one of the winter quarters was £121; in 1907, the addition of the controllers had reduced this figure to £96; while the new burners lately applied have resulted in a further reduction of £65. It was stated that the adoption of suction gas in place of steam at one of the water-works pumping-stations had brought down the cost coal of from 4s. 3d. to 2s. 1½d. a day.

Belfast Gas Undertaking and the Rates.—At a recent meeting of the Belfast Gas Committee, a deputation attended and asked the Committee to continue their contribution out of the gas profits for the payment of interest and sinking fund on borrowed money in connection with the erection of the City Hall. The deputation also asked for a contribution towards the relief of rates the same as last year. Mr. J. A. Doran, the Chairman of the Committee, explained that the Gas Department had been generous in the past towards the Finance and Improvement Committees, and had practically exhausted all their funds, and would require to set aside more reserves on their own behalf than they had done the last few years. He believed, however, that the Committee would accede to their request this year, on account of the dulness of trade generally, and in order that the rates should not be increased. It was afterwards resolved that the application be granted, and a sum of £15,000 be allocated towards the relief of the rates, and £11,400 for interest and sinking fund on borrowed money in connection with the erection of the City Hall. The deputation thanked the Chairman and members of the Gas Committee for the generous way in which they had received and granted the request.

Woking Water and Gas Company.—At the meeting of the Company yesterday, the Directors reported that the balance at the credit of profit and loss account was £5277, out of which they recommended a dividend at the rate of 5 per cent. per annum for the past half year, less tax; leaving £1281 to be carried forward. During the six months, 107 additional house and 24 new meter connections were made, and the mains had been extended by about 1409 yards. The Engineers (Messrs. Joseph Quick and Son) reported that the works, plant, and mains were all in good order.

Extensions at Oswaldtwistle Gas-Works.—An extension of the Ostwaldtwistle District Council's gas-works is to be carried out, including the erection of three more sets of generators, plans and estimates for which have been prepared by the Manager (Mr. J. H. Davies). At the last meeting of the Council, it was explained by Mr. Hargreaves, the Chairman of the Gas Committee, that the plant put down was capable of making sufficient gas for the requirements of the township; but there was a difficulty in meeting the demand in winter, owing to the inadequacy of the plant for conveying the gas from the retorts to the holder. Mr. A. H. Smith, the Gas Engineer and Manager to the Darwen Corporation, who had been called in to advise, stated in his report that, unless the Council went further with the extensions, they would be in a very precarious condition next winter. The Council confirmed a vote of thanks recorded by the Gas Committee to Mr. Smith for his report, which was made on an inspection of the plant. It fully bore out the methods adopted not only by the Manager but by the Committee.

Early Days of Gas Lighting in Exeter.—In connection with the annual meeting of the Exeter Gas Company, the proceedings at which are noticed elsewhere, it may be interesting to point out that the Company is one of the earliest of provincial undertakings of the kind, as Exeter was publicly lighted by gas in July, 1817. The theatre was the first building in which it was used; the occasion being the re-opening, after considerable reconstruction, on Dec. 27, 1819. It appears that the audience were as much interested in the new illuminant as in the performance. So far as the auditorium was concerned, the medium of lighting was a large chandelier, which was thus described by a writer of the time: "The chandelier is 21 feet in circumference and 6 feet high, suspended from a golden sun, in the centre of the painted dome, by four elegant brass pillars. The upper ring is of highly-finished brass open-pattern work, from which four branches of lights on the outside are tastefully disposed at equal distances. From the open pattern to the second ring, a superb basin is formed of diamond cut-glass spangles. From the second to the third is a similar one, both enclosing a variety of lights, illuminating the glass, and exhibiting all the varied colours of the rainbow. From the upper lights to the second ring fall gracefully a mass of spangles. To a third ring is suspended an elegant crown, composed of drops and strings of spangles; and a rich fringe of icicles from the top of each ring gives a splendid brilliancy to the whole."

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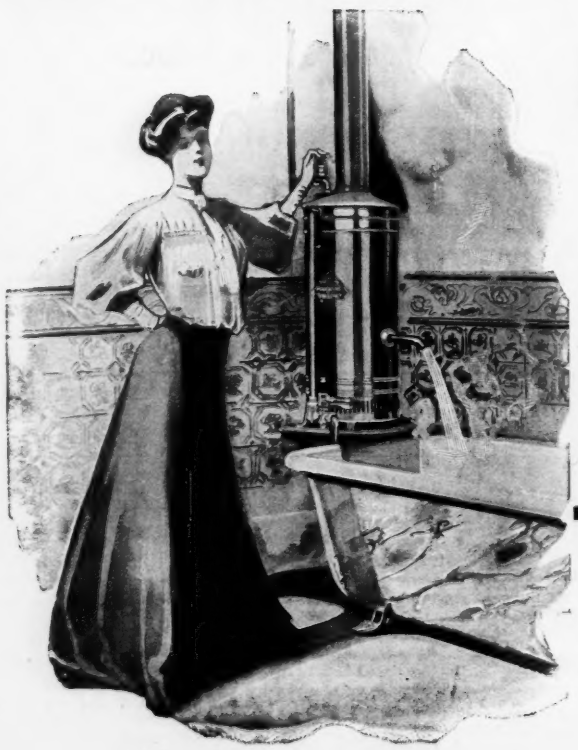

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Reduction in Price for Power at Penrith.—In reply to a memorial, large consumers of gas for power purposes at Penrith have been notified of a decision by the Gas Committee to recommend the Council to reduce the prices as follows, from July 1: Half-yearly consumption of 50,000 to 125,000 cubic feet, 10 per cent. reduction; 125,000 to 250,000 cubic feet, 12½ per cent.; over 250,000 cubic feet, 15 per cent.

Reduction in Price at Rugby.—In the report which they submitted at the annual meeting, the Directors of the Rugby Gas Company recommended a dividend of 14 per cent. on the original share capital and 11 per cent. on the additional capital. They proposed to reduce the price of gas (which was 2s. 4d. per 1000 cubic feet, less discount), as from Jan. 1 last, by 2d. per 1000 cubic feet to ordinary consumers, and 1d. for power.

The Bermondsey Gas Explosion.—The Finance Committee of the Bermondsey Borough Council have recommended the Council to agree to borrow £5000 from the London County Council, at 3¾ per cent., for part cost of repairing Grange Road, where the fatal gas explosion took place in December. The County Council will not sanction the loan until the Borough Council have given an undertaking that the action in granting it shall not be taken as an admission of liability on their part to make good any damage caused by the explosion. The Borough Surveyor has prepared specifications for carrying out the necessary repairs; and these have been submitted to the London County Council, the Metropolitan Water Board, and the South Metropolitan Gas Company for their approval.

Gas Poisoning Case at Portsmouth.—A worn-out gas-bracket, with no flange to the tap, produced such an escape of gas that fatal poisoning ensued to Private Reuben Bowden, R.M.L.I., 25 years of age, who rented a bedroom at a public-house in Portsmouth. The man was quite dead when found partially dressed upon his bed, and the gas was escaping from the bracket. At the Coroner's inquest, the Jury returned a verdict that the deceased had died from poisoning by coal gas; and in a rider it was recommended that the worn-out bracket should be replaced by a safe one.

"Artificial Lighting and Its Evolution" was the title of a lecture delivered a few days ago by Mr. Matt. Dunn, Assistant Manager at the Stockton Gas-Works, in connection with the Literary Section of the Stockton Grange Estate Association. The value of the lecture (which was listened to by a large audience) was much enhanced by Mr. Dunn's many hints as to the economic management of incandescent gas-burners.

The Directors of Messrs. Crossley Bros., Limited, report that the profit at their disposal is £77,523, out of which a dividend has been paid on the preference shares at the rate of 5 per cent. per annum, and a similar one on the ordinary shares, to June 30, amounting to £24,342, and leaving £53,181 for present disposal. The Directors propose a further dividend at the rate of 5 per cent. per annum on the preference shares and 3 per cent. per annum on the ordinary shares (making for the latter 4 per cent. for the year), with £34,541 carried forward.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY. Southampton Gaslight and Coke Company. Applications by March 17.
ASSISTANT WORKS MANAGER (AUSTRALIA). Applications by March 13 to Messrs. Watt, Gilchrist, and Co., King William Street, E.C.
CHEMIST AND DRAUGHTSMAN. Ramsgate Corporation. Applications by March 6.
TRAVELLER (COAL). No. 5065.
MAINTENANCE ATTENDANT. No. 5067.
CANVASSERS. No. 5066.
DISTRICT AND MAINTENANCE INSPECTOR. No. 5069.
COKE BURNER. No. 5068.

Situations, &c., Wanted.

DIVING (SURVEYING OR CONSTRUCTIONAL). Lambert, Kennington.
SECRETARY OR OTHER POSITION. No. 5058.

Plant, &c. (Second-Hand), for Sale.

"JOURNAL" VOLUMES. Dutton, Streatham.

Patent Licence.

LIQUID METERS. Haseltine, Lake, and Co., Chancery Lane E.C.

Stocks and Shares.

SOUTHEND WATER COMPANY. March 16.
TOTTENHAM AND EDMONTON GAS COMPANY. March 15.
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY. March 16.
UXBRIDGE GAS COMPANY. March 16.

TENDERS FOR

Coal.
ASHFORD (KENT) GAS DEPARTMENT. Tenders by March 12.
BRECHIN GAS COMPANY. Tenders by March 10.
DARWEN GAS DEPARTMENT. Tenders by March 27.
LIVERPOOL GAS COMPANY. Tenders by March 13.
MACCLESFIELD GAS DEPARTMENT. Tenders by March 10.
PADIHAM GAS DEPARTMENT. Tenders by March 10.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by March 22.

Sulphuric Acid.
RAMSGATE GAS DEPARTMENT. Tenders by March 8.

Tar and Liquor.
COCKERMOUTH GAS DEPARTMENT. Tenders by March 8.
EXETER GAS COMPANY. Tenders by March 8.
MOUNTAIN ASH URBAN DISTRICT COUNCIL. Tenders by March 9.
PADIHAM GAS DEPARTMENT. Tenders by March 10.
RAMSGATE GAS DEPARTMENT. Tenders by March 8.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 592.

Issue	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 15	10	Alliance & Dublin 10 p.c.	18½—19	..	5 5 3
268,324	10	,,	7	Do. 7 p.c.	12½—13½	..	5 5 8
310,000	Stk.	Jan. 14	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
200,000	5	Oct. 29	6½	Bombay, Ltd.	5⅜—5¾	..	5 10 8
40,000	5	,,	6⅜	Do. New, £4 paid	4—4¼	..	6 2 4
50,000	10	Feb. 25	14	Bourne-mouth Gas and Water } 10 p.c. B 7 p.c. Pref. 6 p.c.	28½—29½*	..	4 14 11
51,810	10	,,	7		16½—16¾*	..	4 3 7
53,200	10	,,	6		15½—16*	..	3 15 0
380,000	Stk.	,,	12½	Brentford Consolidated	243—246*	..	5 1 8
800,000	,,	,,	5⅝	Do. New	184—187*	..	5 1 7
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—122*	..	4 2 0
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	101—103	..	3 17 8
220,000	Stk.	Sep. 11	10½	Brighton & Hove Orig.	214—217	..	4 9 1
246,320	,,	,,	7½	Do. A Ord. Stk.	153—156	..	4 19 4
460,000	20	Oct. 15	10	British	42—43	..	4 13 0
109,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	112—115*	..	5 4 4
165,700	,,	,,	4½	Do. do. 3½ p.c.	83—85*	+1½	5 5 11
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd.	13—13¾	+¼	5 3 8
250,000	Stk.	Dec. 11	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150.000	20	Feb. 25	7½	Cagliari Ltd.	24½—25½*	..	5 13 9
100,000	10	—	—	Cape Town & Dis., Ltd.	4½—5½	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c. Pref.	4½—5½	..	8 3 8
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	47—49	..	6 2 5
£100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	76—78	..	5 15 5
£157 150	Stk.	Feb. 25	5	Chester 5 p.c. Ord.	109—111*	..	4 10 1
1,493,280	Stk.	Aug. 27	5⅛	Commercial 4 p.c. Stk.	108—110	..	4 14 7
560,000	,,	,,	5	Do. 3½ p.c. do.	103—105	..	4 15 3
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	101—103	..	6 6 3
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—140	..	5 0 0
460,170	Stk.	—	5	Derby Con. Stk.	122—124	..	4 0 8
55,000	,,	—	4	Do. Deb. Stk.	103—105	..	3 16 2
148,995	,,	Sep. 30	5	East Hull 5 p.c. Ord.	98—100	..	5 0 0
486,690	10	Jan. 28	12	European, Ltd.	23½—24	..	5 0 0
354,660	10	,,	12	Do. £7 10s. paid.	17½—18	..	5 0 0
15,161,545	Stk.	Feb. 11	4/10/8	Gas } 4 p.c. Ord.	102—103	+1	4 7 11
2,630,000	,,	,,	3½	light } 3½ p.c. max.	87½—88½	..	3 19 1
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	104—106	..	3 15 6
4,193,975	,,	Dec. 11	3	Coke } 3 p.c. Con. Deb.	84½—85½	..	3 10 2
258,740	Stk.	Sep. 11	4⅜	Hastings & St. L. 3½ p.c.	95—97	..	4 17 11
82,500	,,	,,	6¼	Do. do. 5 p.c.	113—115	..	5 8 8
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	18—18½	..	5 18 11
123,570	Stk.	Sep. 11	6½	Ilford "A" and "C"	132—134	..	4 17 0
65,783	,,	,,	5	Do. "B"	104—106	..	4 14 4
51,000	,,	Dec. 30	4	Do. 4 p.c. Deb.	102—104	..	3 16 11
4,940,000	Stk.	Nov. 13	8	Imperial Continental	179—181	..	4 8 5
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	94—96	..	3 12 11
195,242	Stk.	Aug. 27	6	Lea Bridge Ord. 5 p.c.	120—122	..	4 18 4

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
561,000	Stk.	Feb. 25	10	Liverpool United A	227—229*	..	4 7 4
718,100	,,	,,	7	Do. B	69½—171½*	+1	4 1 7
306,083	,,	Dec. 30	4	Do. Deb. Stk.	105—107	..	3 14 9
75,000	5	Dec. 11	6	Ma'ta & Medn, Ltd	4¾—5	+⅛	6 0 0
560,000	100	Oct. 1	5	Met of } 5 p.c. Deb.	101—103	..	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	..	4 7 5
541,920	20	Nov. 13	3½	Monte Video Ltd.	11½—12	..	5 16 8
1,775,892	Stk.	Feb. 25	4½	Newc'tle & G't sh'd Con	107—109*	..	4 2 7
518,795	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	91—93	..	3 15 3
15,000	10	Feb. 25	10	North Middlesex 10 p.c.	19½—20*	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	13—13½*	..	5 3 8
300,000	Stk.	Nov. 27	8	Oriental, Ltd.	140—142	..	5 12 8
60,000	5	Sept. 20	8	Ottoman, Ltd.	6½—6⅝	..	6 5 6
31,830	53	Feb. 25	13	Portsea Island A.	135—137*	..	5 0 7
60,000	50	,,	13	Do. B.	129—131*	..	4 19 3
100,000	50	,,	12	Do. C.	119—121*	..	4 19 2
114,800	50	,,	10	Do. D and E.	101—103*	..	4 17 1
398,490	5	Oct. 29	7	Primitiva Ord.	6½—6⅝	..	5 7 8
796,480	5	Jan. 28	5	Do. 5 p.c Pref.	5—5¼	..	4 15 3
488,900	100	Dec. 1	4	Do. 4 p.c Deb.	95—97	..	4 2 6
1,000,000	10	Oct. 15	8	River Plate Ord.	14—14½	..	5 10 4
312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
250,000	10	Sept. 30	8	San Paulo, Ltd.	14—14½	..	5 10 4
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	49—50	..	5 0 0
135,000	Stk.	Sept. 11	10	Sheffield A	240—242	..	4 2 8
269,984	,,	,,	10	Do. B	239—241	..	4 3 0
523,500	,,	,,	10	Do. C	238—240	..	4 3 4
70,000	10	Oct. 29	10	South African	13½—14	..	7 2 10
6,429,895	Stk.	Feb. 11	5/6/8	South Met., 4 p.c. Ord.	120—122	+1	4 7 4
1,895,445	,,	Jan 14	3	Do. 3 p.c. Deb.	84½—85½	+⅛	3 10 2
209,820	Stk.	Aug. 31	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Feb. 25	5½	S'th Suburb'n Ord. 5 p.c.	119—121*	+½	4 10 11
60,020	,,	,,	5	Do. 5 p.c. Pref.	120—122*	+⅛	4 2 0
117,058	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	124—126	..	3 19 4
102,310	Stk.	Nov. 13	5	Southampton Ord.	109—111	..	4 10 1
120,000	Stk.	Feb. 25	6¾	Tottenham } A 5 p.c.	131—133*	..	5 1 6
423,940	,,	,,	5¼	and } B 3½ p.c.	107—109*	+3½	4 16 4
149,470	,,	Dec. 30	4	Edmonton } 4 p.c. Deb.	100—102	..	3 18 5
182,380	10	,,	8	Tuscan, Ltd.	⅞—9½	..	8 13 0
149,900	10	Jan.	5	Do. 5 p.c. Deb. Red.	99—101	..	4 19 0
236,476	Stk.	Feb. 25	5	Tynemouth, 5 p.c. max.	104—106*	+⅛	4 14 4
255,656	Stk.	Feb. 25	6¾	Wandsworth } B 3½ p.c.	128—130*	+3½	5 0 0
79,416	,,	Dec. 30	3	and } 3 p.c. Deb. Stk.	72—74	..	4 1 1
895,872	,,	Feb. 25	5½	West Ham 5 p.c. Ord.	113½—113¾*	+1	4 10 11
210,000	,,	,,	5	Do. 5 p.c. Pref.	124—126*	+2½	3 19 4
253,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	105—107	..	3 14 9

Prices marked * are "Ex div."

It has been agreed that the profit-earning departments of the Stockport Corporation shall this year hand over the same amount as last year in relief of the rates. This means £10,000 from the Gas Department, and £2000 from the Electricity Committee.

The half-yearly conference of the representatives of the Richmond Gas Stove and Meter Company, Limited, was held at the Company's Warrington office last Wednesday—Mr. H. M. Thornton presiding. In the evening the representatives were entertained at dinner by the Company.

The Gas Committee of the Bolton Corporation decided, at last Friday's meeting, to advance the wages of the carters in the employ of the department from 24s. to 25s. per week. The application of the foremen stokers at Lum Street works for an increase in pay was not acceded to. They wanted time-and-a-quarter for Sunday labour.

The Guardians at Gosport have authorized the Gosport Gas Company to instal inverted incandescent lamps throughout the House of Industry, in place of the old fittings. The 132 burners are to be maintained and renewed at a cost not exceeding £3 6s. per quarter, and the conversion and fixing will be £47 7s. 6d. It is estimated that a much better light will be obtained, and 50 per cent. saving in gas effected.

The valuation of water-works was recently before the Mississippi Supreme Court in suits by the State Revenue Agent against Messrs. S. R. Bullock and Co. and the Vicksburg Water-Works Company. An exclusive grant to a company to supply water in a city was held to be a franchise, and taxable as personal property. An assessment of "capital invested in merchandizing and manufacturing" did not include such a franchise, nor the "solvent credits" of the Company; but it did include the sums spent for pipes, hydrants, and such parts of the plant.

Responding to the toast of "The Institution," at the annual dinner of the Manchester Section of the Institution of Electrical Engineers held on Friday night, Mr. W. M. Morley, the President, said that, whatever might be the faults respectively of municipalities and companies, they could at least congratulate Manchester on the fact that its Corporation were in the proud position of supplying more electrical energy on the ratio of population than any other city in the country. He added that not more than 4 per cent. of the machinery or material used in the public supply stations was imported; and he did not think they need be afraid of any comparison with their friends in Germany, France, or anywhere else.

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See Advertisement on p. 575.

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See Advertisement, Feb. 9, p. III. of Centre.

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See illustrated advertisement, Feb. 9, p. I. of Centre.

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